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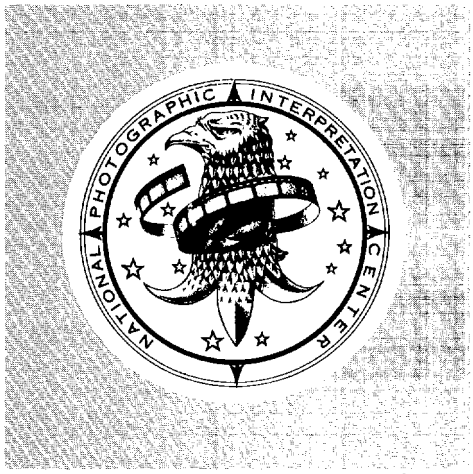
[redacted]



NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

USER'S MANUAL FOR THE REAL-TIME MENSURATION PROGRAM

25X1

[redacted]

Declassification Review by
NIMA/DoD

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25X1

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FEBRUARY 1971

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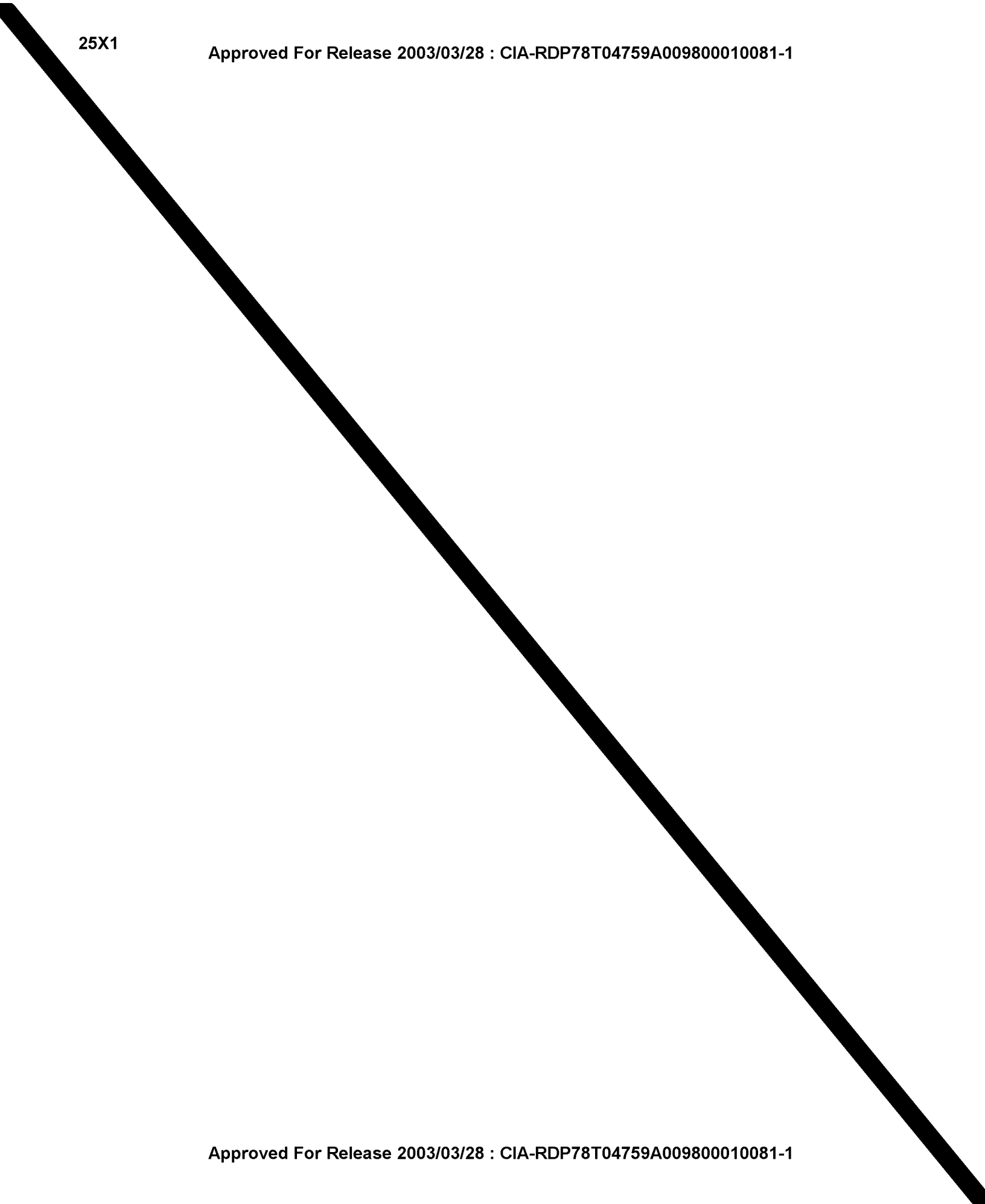

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USER'S MANUAL

FOR THE

REAL-TIME MENSURATION PROGRAM

February 1971

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25X1 [redacted]

TO THE USERS

The USER'S MANUAL FOR THE REAL-TIME MENSURATION PROGRAM, [redacted] 25X1
replaces INSTRUCTIONS FOR OPERATING THE VIEWER-TELETYPEWRITER-COMPUTER
25X1 MENSURATION SYSTEM, [redacted] Whenever necessary, the Real-Time
Mensuration Program and the USER'S MANUAL FOR THE REAL-TIME MENSURATION
PROGRAM will be modified to accommodate intelligence derived from other
camera systems.

This manual explains how to use the Real-Time Mensuration Program and the related equipment. It also contains step-by-step instructions for measuring objects discernible on various kinds of imagery. However, this manual does not contain details on photogrammetric techniques. The subject matter is organized by camera system. Thus, for any given camera system, all available options and the procedures related to each appear in one chapter.

This manual is not to be used with the AID publication, Introduction to the Remote Access Computer Service.

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CHAPTER I. THE REAL-TIME MENSURATION PROGRAM

PURPOSE AND SCOPE

The Real-Time Mensuration Program (RTMP) calculates accurate measurements of objects discernible on the photography derived from the camera systems used by NPIC. The program can calculate distances, azimuths, geodetic coordinates, heights, and areas of objects visible on the film. In addition to these calculations, the program can create a plot of the objects being measured. The use of this capability is optional.

You use the program from your work area, which is referred to as a remote station. This station consists of at least a teletypewriter and a comparator; it may also include a plotter. All of this equipment is connected to, i.e., on line with, the UNIVAC 494 computer system. This equipment is used to send data to and receive data from that system. In general the RTMP requires that film be mounted on a comparator and identified via teletype messages. The points on which calculations are to be performed are then aligned under the comparator crosshairs and transmitted to the program. Within real time, the results of the calculations are printed via a teletypewriter.

MENSURATION PARAMETERS FILE

The Mensuration Parameters File (MPF)* contains ephemeral data and mensuration parameters [redacted] The data for a given mission remains in the MPF for a period of six months. This data can be utilized by the RTMP to identify the characteristics of the photography being used. 25X1

The RTMP will automatically retrieve data from the MPF. If the ephemeral data for the photography being used is in the MPF, the program will search the file and retrieve the necessary parameters. The only parameters that must be input via a teletype will be those unique to the chip or frame being processed.

WHEN TO USE THE PROGRAM

At the present time, the Real-Time Mensuration Program is available weekdays at the times listed below. If these hours are changed, all affected components will be notified.

Monday	Tuesday	Wednesday	Thursday	Friday
0815-1630	0815-1630	0815-1630	0815-1630	0815-1630

To use the program outside these hours, complete an Operations Branch Work Request form, IP FM 340 (10-69), and submit it to the Production Analysis Section, Operations Branch, AID, (2N 636) before the program is needed. A sample work request appears on the next page.

* Formerly known as the Attitude and Position Catalog (APC).

25X1 [redacted] 25X1

25X1

OPERATIONS BRANCH WORK REQUEST

TO: PRODUCTION ANALYSIS SECTION/OB/AID/PSG

PAS NO. (Leave blank)	COMPONENT CODE: L70	PROJECT NO: 143231	JOB ID (Leave blank)	PAS	IN / OUT
REQUESTER	PHONE NO.	QUANTITY: NA	TYPE RUN (Leave blank)		
[redacted]	PRODUCT			DEAD LINE	OUT: 1 February 1971
SECURITY CLASSIFICATION (MUST BE COMPLETED BY REQUESTER): NA			TYPE FORM: NA	CUST PICK UP	BADGE NO. / OUT
CONTROL NO.: NA		WORK SHEETS: ☐ YES ☒ NO	BURST: ☐ YES ☒ NO		IN
TRIM: ☐ RIGHT ☐ LEFT ☒ NEITHER		BIND: ☐ LEFT ☐ TOP ☒ NEITHER		COS	OUT

FOR PRODUCTION ANALYSIS SECTION USE ONLY

DATA CONTROLLER	DATE	SET UP TIME	BADGE NO.	DBS	IN / OUT
SCHEDULER	494-1	494-2	1004	DIS	IN / OUT
QUALITY CONTROLLER	INPUT DATE	CHECKTIME	BADGE NO.	EAM	IN
	OUTPUT DATE	CHECKTIME	BADGE NO.		OUT

JOB DESCRIPTION

Please load the Real-Time Mensuration Program for use between 0815 and 1630 on Saturday, 1 February 1971.

IP FM 340 (10-69)

25X1 [redacted]

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CHAPTER II. THE EQUIPMENT

ASR AND KSR TELETYPEWRITERS

Whenever you use the Real-Time Mensuration Program, you will use either an ASR or a KSR Model 35 teletypewriter to

* transmit to the computer parameters that will identify the film
* receive calculations produced by the program

TURN-ON PROCEDURES

Before a teletype can be used with the RTMP, it must be turned on. To turn on a teletype follow these procedures.

1. Turn the ON-OFF or MOTOR ON switch to ON.
2. If the teletype has a RYE/REAL TIME toggle switch, move it to the RYE position
3. If the BREAK light is ON, press and release the BRK-RLS button; if it is not ON, omit this step.

4. Press and release the ALT MODE key.
5. Press and hold the CTRL key.
6. Press and release the Y key.
7. Press and release the G key.
8. Release the CTRL key.

If the computer is functioning properly and this teletype is currently communicating with the RTMP, you will receive this message:

LEN T RTM READY

If this message does not appear, try again later.

If the turn-on sequence listed above were summarized, it could be presented in this manner.

Turn teletype on
Move RYE/REAL TIME (if any) to RYE
Press BRK-RLS (if applicable)
ALT MODE
CTRL (hold)
Y
G

CONVERTING A TELETYPE

Certain teletypes are used primarily for the RTMP. These teletypes are normally in a technical mode; other teletypes are in an analytic mode. However, teletypes that are normally in a technical mode can also be used in an analytic mode. If your teletype has been used in an analytic mode, you will receive no teletype messages when you try to use the RTMP. If this happens, reconvert the teletype to the technical mode so that it can again be used with the RTMP.

To do this press these keys:

ALT MODE
CTRL + Y (SVC)
CTRL + G (BELL)

You will receive this message indicating that the conversion is complete:

LEN T RTM READY

This procedure may also be used to effect the conversion:

ALT MODE
CTRL + Y
T+LOGICAL EQUIPMENT NUMBER
(e.g., T112)

You will receive this kind of message when the conversion has been completed:

TLOGICAL EQUIPMENT NUMBER

25X1 DUAL-SCREEN MEASURING PROJECTOR

Whenever you use the RTMP, you will use a comparator to

* locate points of interest on a photograph
* determine the x and y coordinates of selected points of interest
* transmit these values to the program

FIGURE 1. [redacted] DUAL-SCREEN MEASURING PROJECTOR.

25X1 The [redacted] Dual-Screen Measuring Projector (Figure 1) has two screens upon which images are projected. The large screen is used for scanning; the small screen, for measuring. The [redacted] has a main console and an auxiliary console. The main console is used for projecting images; the auxiliary console, for power. 25X1

PARTS OF
MAIN CONSOLE

The parts of the main console and their respective functions are given in Table 1.

Table 1. [redacted] Main Console Parts and Functions 25X1

Part	Function
Y-COORDINATE & X-COORDINATE windows	Display relative coordinates in microns of point under crosshairs on small screen
RESET button	Causes both coordinates to be set at 500,000 counts; does not move film
RETICLE BRILLIANCE switch	Adjusts intensity of reticle to desired illumination
FILM SLEW wheel	Permits film advancement to new frame in either direction
LOW, MEDIUM, & HIGH buttons	Determine speed at which FILM SLEW wheel will advance film

25X1

25X1

Table 1. [redacted] Main Console Parts and Functions (Continued)

Part	Function
ADVANCE-CLAMP button	In CLAMP position when mensuration is being done; automatically returns to ADVANCE position when FILM SLEW wheel is turned; returns to CLAMP position when FILM SLEW wheel is released
FRAME CENTER button	Causes crosshairs of small screen to be over center of stage; x & y coordinates are changed to accommodate all stage movement
RETICLE wheel	Rotates reticle of small screen
Y DOWN LIMIT & UP LIMIT lights; X LEFT LIMIT & RIGHT LIMIT lights	Indicate stage has reached its movement limit & must be moved in opposite direction
Y wheel	Moves stage toward or away from front of main console
X wheel	Moves optics to right or left
DATA RECORD buttons	Used for transmitting points to program
TRANSMISSION FAILURE light	Indicates failure in transmitting points; must be pressed before additional points can be transmitted
TRANSMISSION light	Indicates point is being sent to program

Table 1. [redacted] Main Console Parts and Functions (Continued)

Part	Function
INTERLOCK FAILURE light	Indicates ON button at rear of main console is on & must be turned off
X-Y SLEW handle	Permits movement of stage & optics even though you do not turn X or Y wheel
FOCUS switch	Adjusts film focus to desired position
ILLUMINATION CONTROLS	Adjusts lighting on large screen (coarse adjustment) or small screen (fine adjustment)
MAGNIFICATION lights	Indicate magnification on small screen
ADVANCE switch	Allows magnification to be changed
INDICATIVE DATA switches	Used to send control numbers with coordinates
INDICATIVE FUNCTION buttons	Used to determine output from RTMP; sometimes referred to as output function buttons

TURN-ON
PROCEDURES

25X1 If the [redacted] has been turned off for any reason, complete these turn-on procedures. On the auxiliary console,

1. Check the reading of the two meters located in the SERVOMOTOR AMPLIFIER area. Both of the meters must read less than 50 milliamperes.

2. In the CIRCUIT BREAKERS area, move the Servo H.V. and the Vacuum Pump toggle switches to the ON position.

3. In the CURRENT ADJUST area, move the toggle switch to the OPERATING position.

Most of these switches may be left on until the end of a working day. However, you should turn the Vacuum Pump switch off after using the [redacted] 25X1

MOUNTING
THE FILM

25X1 To mount film on an [redacted] follow these steps in the order listed. At the rear of the main console,

1. Press the ON button.

2. Press the ADVANCE-CLAMP button until the ADVANCE portion lights up.

3. Press the SLEW-LOAD button until the LOAD portion lights up.

4. Mount the film on the stage.

5. Press the SLEW-LOAD button until the SLEW portion lights up.

6. Using the FILM SLEW dial, advance the film to the desired frame.

7. Press the ADVANCE-CLAMP button until the CLAMP portion lights up.

8. Press the ON button; the light will go out.

[redacted] COMPARATOR

25X1
25X1
25X1

25X1 There are several different models of a [redacted] comparator in [redacted] One of these models, 1210, appears in Figure 2. On a [redacted] comparator film is viewed through a binocular optical system. As the light rays pass through the film, they are magnified and reflected into the eyepieces. This comparator consists of a main console and an electronic module. The main console is used for viewing film and determining relative coordinates. The electronic module is used to display relative x and y coordinates and to transmit points to the program.

25X1

PARTS OF COMPARATOR

25X1 The parts of a [redacted] comparator and their respective functions are
25X1 listed in Table 2. All [redacted] comparators in [redacted] have these parts.

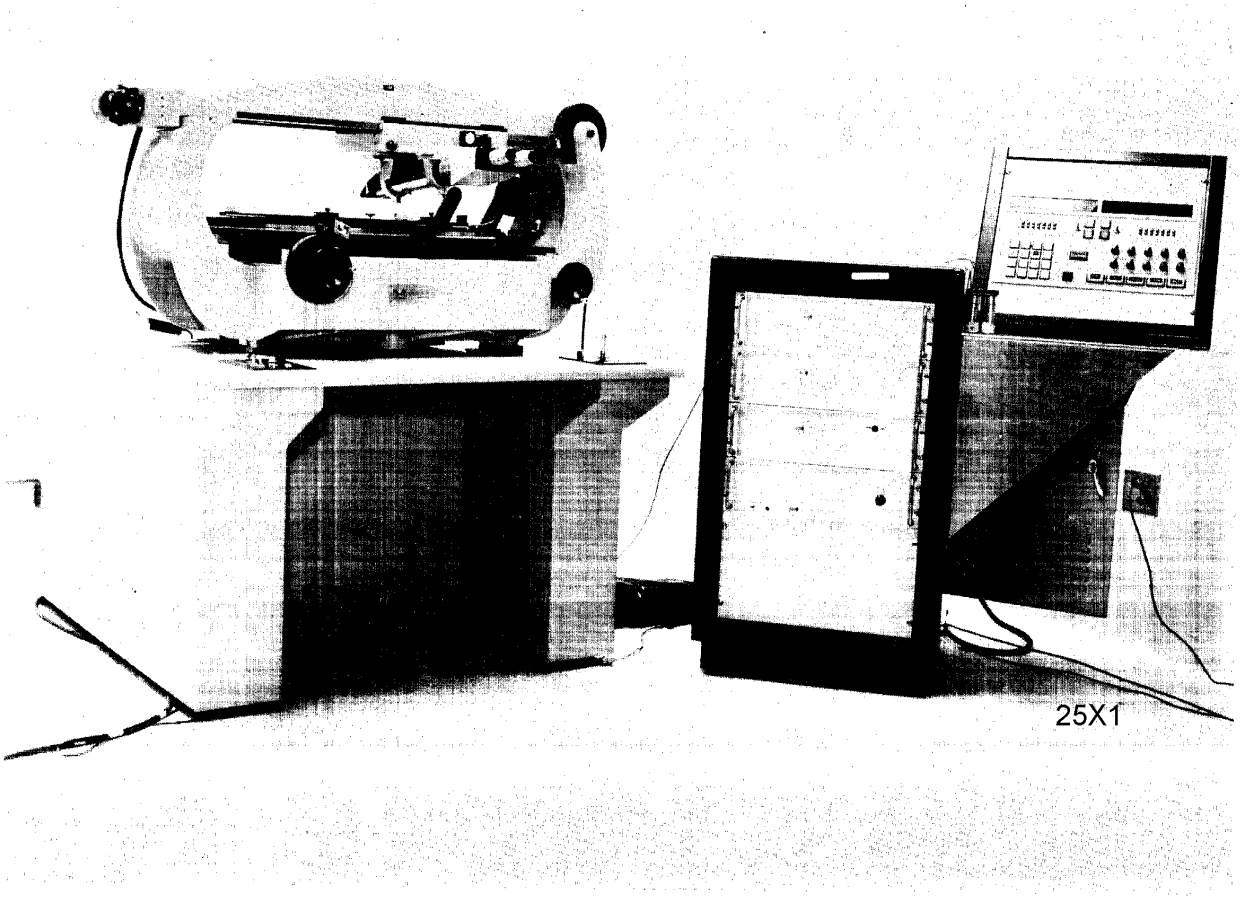
25X1

Table 2. [redacted] Comparator Parts and Functions

25X1

Part	Function
MAIN CONSOLE	
Stage	Platform on which film is placed
Platen	Holds film in position on stage
Optics	Used to magnify & focus image

25X1



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25X1

FIGURE 2. [redacted] COMPARATOR, MODEL 1210.

25X1

Table 2. [redacted] Comparator Parts and Functions (Continued)

Part	Function
FIELD BRIGHTNESS dial	Adjusts small area light on film
X-axis wheel	Moves stage; permits adjustment of x coordinate
Y-axis wheel	Moves optics; permits adjustment of y coordinate
Slew handle	Permits simultaneous movement at variable speed in x & y directions
X and Y SAFETY LIMIT lights	Indicate movement in x or y direction has reached its limit; direction of movement must be reversed
Plate focus wheel	Permits adjustments of film focusing
Reticle focus wheel	Focuses reticle to desired point
Eyepiece	Used to balance focusing to both eyes
Zoom dial	Increases magnification from 1 to 2 times over the selected magnification
ELECTRONIC MODULE	
X AXIS and Y AXIS windows	Display relative x & y coordinates of point under cross-hairs

Table 2. [redacted] Comparator Parts and Functions (Continued)

Part	Function
PRESET RESET buttons	Change x & y axis values to values indicated on PRESET RESET number wheels
ZERO RESET buttons	Change x & y axis values to zero (Ø)
PRESET RESET number wheels	Used with PRESET RESET buttons for changing coordinate values
DIRECTION toggle switches	Used to rotate x-axis or y-axis by 180°
INSTRUCTION CHARACTER buttons (16)	Used to determine output from RTMP; sometimes referred to as output function buttons
SPECIAL CHARACTER dials	Used to send control numbers with coordinates
READOUT CHARACTER buttons	Used to transmit points to program
SUBSTAGE light	Illuminates platen for general viewing
TRANSMISSION light	Indicates data is being transmitted to program
ALARM RESET button	Lights & activates buzzer whenever transmission error occurs; must be pressed after error has occurred to deactivate buzzer & to transmit more data

TURN-ON
PROCEDURES

25X1 If the [ ] comparator you want to use has been turned off for any reason, complete these turn-on procedures.

On the main console,

1. Move the POWER toggle switch to the ON position.
2. Move the SUBSTAGE switch to the ON position.
3. Wait until the power light on the main console comes on

On the electronic module,

1. If the electronic module is equipped with a PUNCH/COMPUTER toggle switch, move it to the COMPUTER position.
2. Move the POWER switch to the OFF position.
3. Move the SYSTEM MODE dial to the TWO-AXIS position.

MOUNTING
THE FILM

The procedures for mounting film on a [ ] comparator are the following: 25X1

1. Press the FILM PLATEN button. This will activate the electromagnets on the platen and separate the plates of glass.
2. Insert the film between the two plates of glass.

25X1

FIGURE 3. [redacted] STEREO CHIP COMPARATOR.

25X1 STEREO CHIP COMPARATOR

25X1 The Stereo Chip Comparator or Chip comparator (Figure 3) permits stereo viewing by means of a binocular optical system and two pieces (chips) of photography. Measurements are performed on only one chip; the other is for viewing only.

The Chip comparator has two principal components: a main console and an electronic module. The main console is used for viewing and determining relative coordinates. The electronic module is used to

* control the photo environment, i.e., adjust the lighting, color, etc.
* display x and y coordinates
* transmit points to the program

PARTS OF COMPARATOR

The parts of a Chip comparator and their respective functions are listed in Table 3 on the next page.

Table 3. Chip Comparator
Parts and Functions

Part	Function
	MAIN CONSOLE
Y AXIS drive	Moves stages toward front or rear of comparator; gross movements
Y AXIS hand wheel	Moves stages toward front or rear of comparator; fine movements
X AXIS drive	Moves stages to right or left; gross movements
X AXIS hand wheel	Moves stages to right or left; fine movements
AUTO-COMPENSATOR Y AXIS & X AXIS toggle switches	Activate auto-compensator
X-READY and Y-READY lights	Indicate power has reached operation level
Left stage	Holds chip to be measured
Right stage	Holds second chip for stereo viewing; may be moved by hand for gross adjustments or by screws for fine adjustments
Height adjustment dial	Used for gross focus adjustments

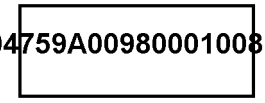

Table 3. Chip Comparator Parts and Functions (Continued)

Part	Function
Zoom dial	Increases magnification from 1 to 2 times
Rotation dials	Rotate viewed images without rotating chips
Elevation adjustment switch	Permits comfortable positioning of optics
Interpupillary distance gauge	Increases or decreases distance between eyepieces
Eyepieces	Used for fine focus adjustments
Reticle adjustment dial	Used to focus reticle
ELECTRONIC MODULE: CONTROL PANEL	
SPOT INT LEFT & RIGHT dials	Increase illumination for left & right stages
LEFT & RIGHT FILTER SELECTOR dials	Permit colors of light to be passed through film
Power light	Indicates MAIN POWER switch is ON
SPOT LT & SPOT RT toggle switches	Determine amount of light passed through film when concentrated light beam is used
SPOT LEFT & SPOT RIGHT toggle switches	Permit use of a concentrated beam

Table 3. Chip Comparator Parts and Functions (Continued)

LEFT & RIGHT GEN ILL toggle switches	Illuminate entire stage
PUMP toggle switch	Activates vacuum pump
VAC LEFT & VAC RIGHT toggle switches	Create suction to film on stages
VAC PLATEN switch	Creates suction to stabilize right stage
ELECTRONIC MODULE: TRANSMISSION PANEL	
X AXIS & Y AXIS windows	Display relative x & y coordinates of point on film under crosshairs
PRESET RESET buttons	Change x & y axis values to values indicated on PRESET RESET number wheels
ZERO RESET buttons	Change x & y axis values to zero (Ø)
PRESET RESET number wheels	Used with PRESET RESET buttons for changing coordinate values
DIRECTION toggle switches	Used to rotate x-axis or y-axis by 180°
INSTRUCTION CHARACTER buttons (16)	Used to determine output; also referred to as output function buttons
SPECIAL CHARACTER dials	Used to send control numbers with coordinates
READOUT CHARACTER buttons	Used to transmit points to program

Table 3. Chip Comparator Parts and Functions (Continued)

Part	Function
TRANSMISSION light	When illuminated, indicates data is being transmitted to program
ALARM RESET button	Lights & activates buzzer whenever transmission error occurs; must be pressed after error has occurred to deactivate buzzer & to transmit more data

TURN-ON PROCEDURES

If the chip comparator you want to use has been turned off for any reason, complete these turn-on procedures.

1. Move the MAIN POWER switch on the control panel to the ON position.
2. If the electronic module is equipped with a PUNCH/COMPUTER toggle switch, move it to the COMPUTER position.
3. Move the X AXIS and the Y AXIS POWER switches to the ON position. These switches are located on the lower left-hand side of the main console.
4. Wait until the X-READY and Y-READY lights on the front of the main console come on. This will usually take about 30 minutes.

COMPENSATING
A COMPARATOR

On a chip comparator it is necessary to make adjustments to stabilize the x and y coordinates. This process is known as compensating a comparator. You should compensate a chip comparator every morning before it is used. The procedures for compensating a comparator are the following:

1. Press the X AXIS LEFT drive until movement reaches its limit and the stage stops.
2. Press the Y AXIS IN drive until movement reaches its limit and the stage stops.
3. Zero reset the x and y coordinates.
4. Move the X AXIS AUTO COMPENSATOR toggle switch to the ON position.
5. Press the X AXIS RIGHT drive and allow the stage to move about two inches.
6. Release the X AXIS RIGHT drive and immediately press the X AXIS LEFT drive.
7. When the stage reaches its movement limit, release the X AXIS LEFT drive.
8. Move the X AXIS AUTO COMPENSATOR toggle switch to the OFF position.
9. Move the Y AXIS AUTO COMPENSATOR toggle switch to the ON position.
10. Press the Y AXIS OUT drive and allow the stage to move about two inches.
11. Release the Y AXIS OUT drive and immediately press the Y AXIS IN drive.

12. When the stage reaches its movement limit, release the Y AXIS IN drive.

13. Move the Y AXIS AUTO COMPENSATOR toggle switch to the OFF position.

PLACING
THE CHIPS

Placing the chips on a chip comparator involves these steps in the order listed.

1. Place the chip to be measured on the left stage.

2. Move the PUMP toggle switch to the ON position.

3. Move the VAC LEFT toggle switch to the ON position.

4. If you want stereo viewing, place the second chip on the right stage.

5. Move the VAC RIGHT to the ON position.

25X1 [ ] MICRON MENSURATION STAGE 25X1

25X1 The [ ] Micron Mensuration Stage or [ ] Comparator (Figure 4) is a relatively simple device that resembles a microscope. Depending on the optics selected, it can be used for either mono or stereo viewing. The 25X1 [ ] comparator consists of a viewing unit, an electronic module, and a control cabinet. The viewing unit is used for placing and viewing the chip(s). The electronic module records the movement of the film and transmits information to the program. The control cabinet contains the power switches for the device.

25X1

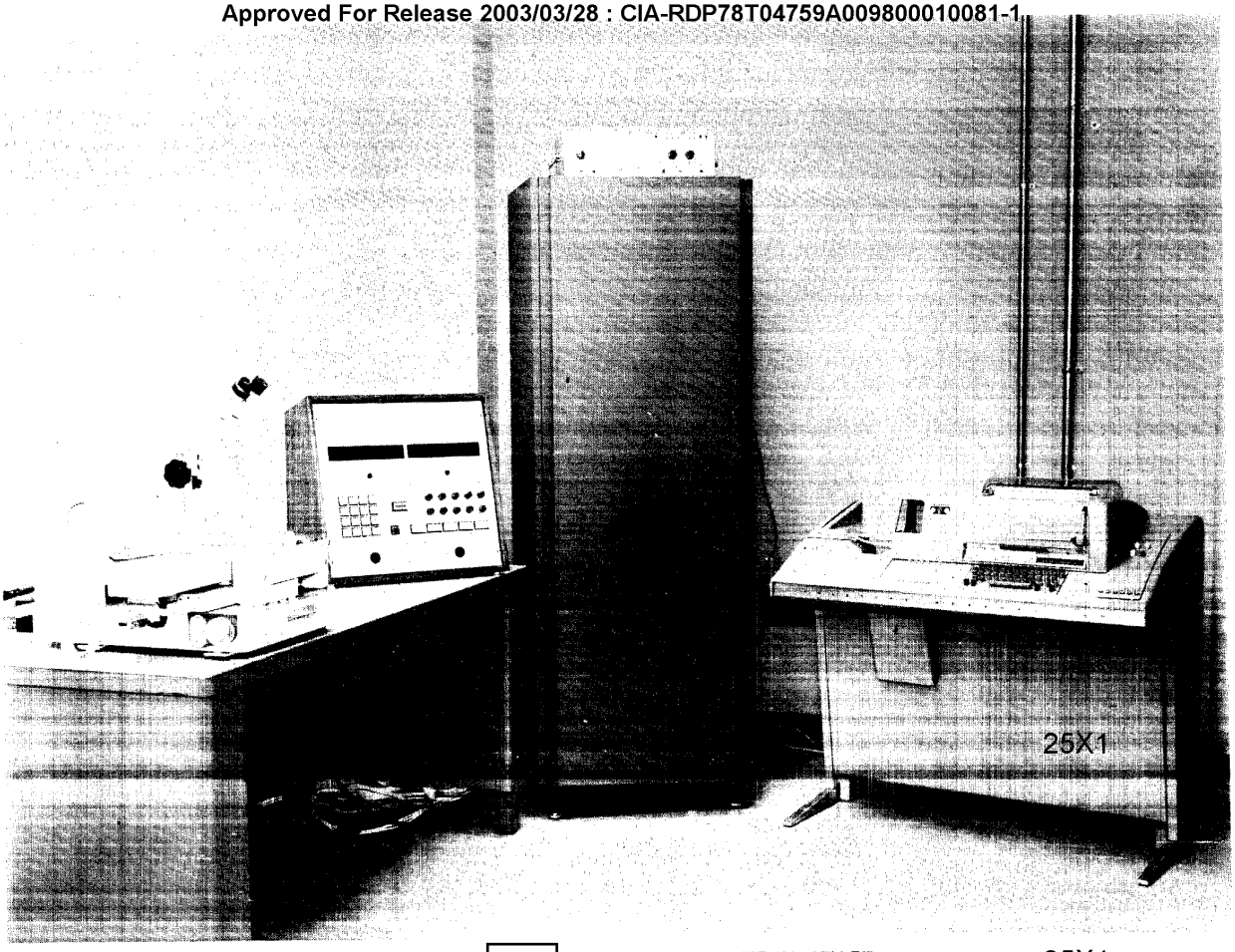

FIGURE 4. [redacted] MICRON MENSURATION STAGE.

PARTS OF COMPARATOR

25X1 The parts of a comparator and their respective functions are listed in Table 4.

Table 4. Comparator Parts and Functions 25X1

Part	Function
VIEWING UNIT	
X-AXIS control knob	Permits fine adjustments in x direction
Y-AXIS control knob	Permits fine adjustments in y direction
Magnification control	Permits change in magnification
Field brightness dial	Permits adjustment of light passing through film
Ready light	Indicates power has reached operational level
Lock switch	Locks stage in current position
Film clips	Used to secure film to stage
Focus control knob	Permits fine focusing adjustments
ELECTRONIC MODULE	
X-AXIS & Y-AXIS windows	Display relative x & y coordinates of point on film under crosshair

25X1 Table 4. Comparator Parts and Functions (Continued)

Part	Function
INSTRUCTION CHARACTER buttons (16)	Used to determine output; also referred to as output function buttons
SPECIAL CHARACTER dials	Used to send control numbers with coordinates
READOUT CHARACTER buttons	Used to transmit points to program
X & Y range lights	Indicate movement limits in x & y directions
X & Y range speakers	Buzz when x & y movement limits are reached
TRANSMISSION light	When illuminated, indicates data is being transmitted to program
ALARM RESET button	Lights & activates buzzer whenever transmission error occurs; after an error, must be pressed to deactivate buzzer

TURN-ON PROCEDURES

25X1 If the comparator has been turned off for any reason, complete these turn-on procedures.

1. Turn the main power switch in the control cabinet on.
2. When the Ready light (on the viewer unit) lights, turn the Power Unit switch in the control cabinet on.

PLACING
THE CHIPS

Placing the chip(s) on a comparator involves these steps in the order listed.

1. Place the chip(s) on the stage of the viewing unit.
2. Using the film clips, clamp the film down.

25X1

USING THE TRANSMISSION BUTTONS

There are five buttons on a comparator which you will use to transmit points to the program. These buttons are labeled FIDUCIAL, INITIAL, INTERMEDIATE or NORMAL, TERMINAL, and MULTIPLE or ERROR. On an they appear on the main console in the area marked DATA RECORD. On a comparator they appear on the transmission panel of the electronic module in the area marked READOUT CHARACTERS. How to use the transmission buttons is explained in Table 5, which appears on the following pages.

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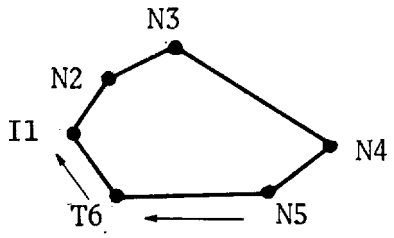
Table 5. How to Use the Transmission Buttons*

Button	How To Use
FIDUCIAL	During comparator initialization, to transmit film reference points to establish coordinate system
	After all output is received, to terminate frame operations
INITIAL	To begin new sequence of points; previous points disregarded; following points (other than I) processed
	During comparator initialization in AUP4B option, to transmit required image control data
	In options using variable filmspeed, to transmit point required for determining measured filmspeed
	For plotter initialization, to transmit points to establish plot origin & scale
INTERMEDIATE or NORMAL	To transmit points between first & last points in a sequence; not to be processed as an end of pointing sequence
	In options using variable filmspeed, to correct errors in transmission of I points required for determining measured filmspeed

Table 5. How To Use the Transmission Buttons* (Continued)

Button	How To Use
TERMINAL	To terminate a sequence of points as in • closing a polygon In a sequence containing an I point, several N points, & a T, transmission of T point will cause calculations to be performed from last N point to T & then from T to I



• spoking
In a sequence containing an I point & 5 T points, calculations made from the I to each T; no calculations made from one T to another

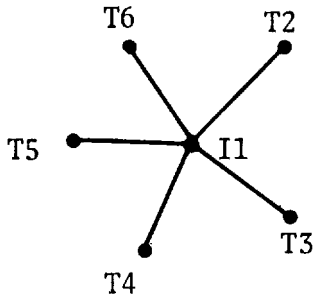
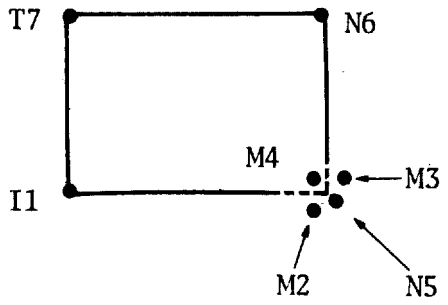


Table 5. How To Use the Transmission Buttons (Continued)

Button	How To Use
TERMINAL (Continued)	To indicate end of transmission of time marks to be used for determining measured filmspeed; variable filmspeed options only
MULTIPLE	To obtain measurements with points which can only be estimated; if a point is indefinite, a series of approximate points can be sent as M points; after sending sufficient M points, send appropriate point (i.e., I, N, or T); M points plus I, N, or T geometrically averaged to produce 1 point; calculations performed on averaged point as though transmitted with specified designator



* In the illustrations the points are numbered in the order in which they are transmitted. Character designators for the points are these: F = fiducial, I = initial, N = intermediate or normal, T = terminal, and M = multiple.

USING THE OUTPUT FUNCTION BUTTONS

Every comparator used with the RTMP has an array of 16 buttons used to determine output. These buttons appear on the main console of an [redacted] in the area marked INDICATIVE FUNCTIONS. On a [redacted] comparator they are located on the transmission panel of the electronic module and are marked INSTRUCTION CHARACTERS. The labels on these buttons may vary slightly from one comparator to another. However, the functions of the buttons are the same for all comparators, and they are frequently referred to as output function buttons (Figure 5).

You must press the appropriate output function button(s) for the computations you want before you transmit a sequence of points. Several output function buttons may be pressed concurrently to obtain various calculations for one sequence of points. After you receive the output for a given sequence of points, you may release those buttons and press the appropriate buttons for the next sequence of points. Output function buttons are explained in Table 6.

Table 6. Output Function Buttons

Button	Output
DISTANCE	Distance - between 2 consecutive points at ground level - between series of points at ground level - between 1 initial point & several terminal points, each of which is used to calculate distance from initial point; called spoking

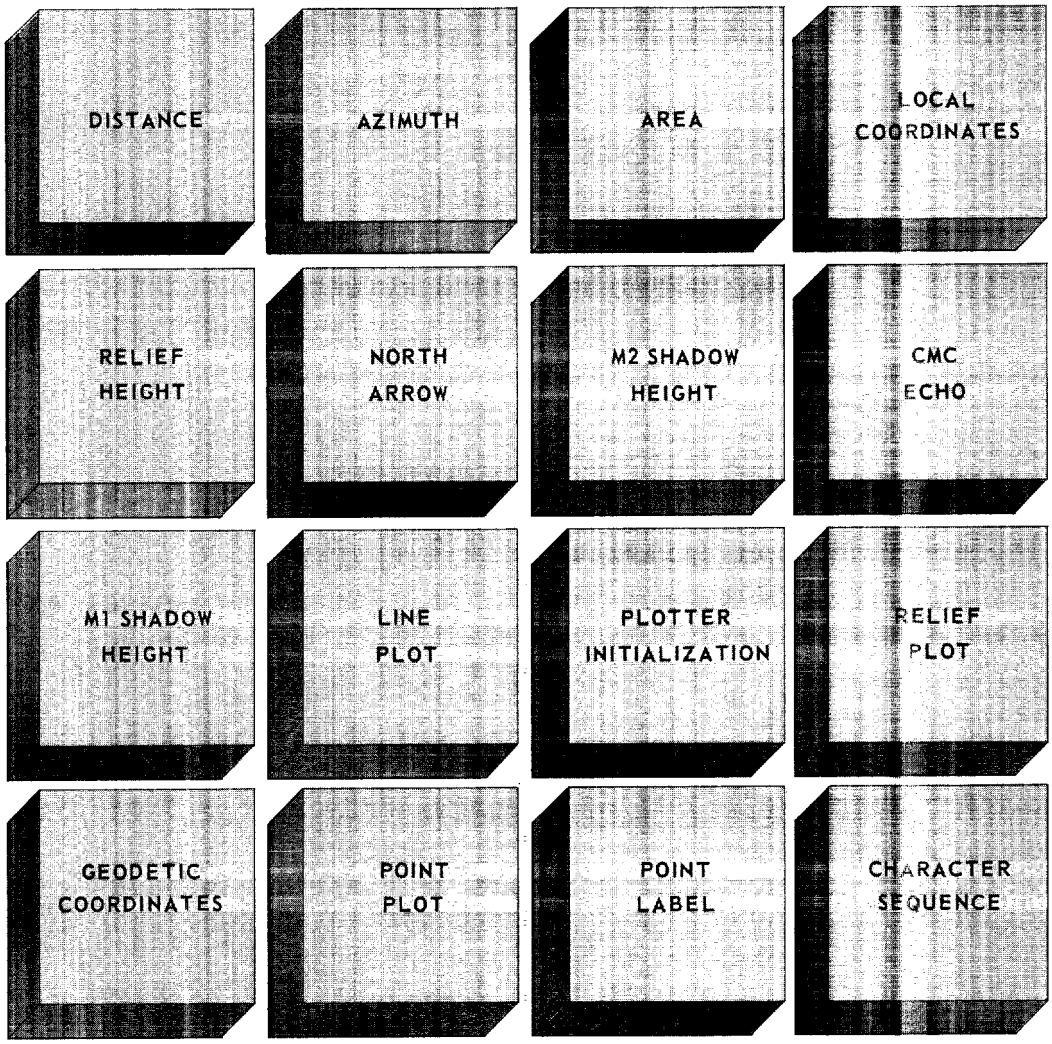


FIGURE 5. OUTPUT FUNCTION BUTTONS. The labels on these buttons may vary slightly, but the functions are the same for all comparators used with the RTMP.

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Table 6. Output Function Buttons (Continued)

Button	Output
AZIMUTH	Azimuth - from true North; of 2 consecutive points at same elevation; always relative to first of 2 points transmitted - from center point to several other points
AREA	Area of polygon
LOCAL COORDINATES	Local vertical coordinates of point transmitted; this coordinate system has z axis positive up along geodetic normal, y axis in direction of ground track velocity vector, & x axis to form a right-handed coordinate system; origin of system is at lens node of camera at time of - zero scan for panoramic photography - grid center T/D for chips
RELIEF HEIGHT	Relief height of vertical objects only; e.g., poles, walls, bldgs, or holes
NORTH ARROW	True-north arrow drawn on completed plot

Table 6. Output Function Buttons (Continued)

Button	Output
M2 SHADOW HEIGHT	M2 shadow height of objects; also called Q factor shadow height; uses sun angle, solar azimuth, position of tip of object's shadow & position of top of object to calculate vertical distance
CMC ECHO	Comparator coordinates in microns & counts; same count as x & y coordinates in windows on comparator
M1 SHADOW HEIGHT	M1 shadow height; vertical objects only; uses solar elevation, position of tip of shadow, & position of base of shadow to calculate height; for best results, shadow should lie on level ground
LINE PLOT	Plotted lines; determined by type of point transmitted - initial: pen head moves; no line is drawn; used to move from one set of plotted lines to another - intermediate: pen head moves; line is drawn - terminal: pen head moves; line is drawn Spoking: a sequence with an initial point and several terminal points will cause spoking; line drawn from initial point to first terminal; pen head returns to initial point after every terminal

Table 6. Output Function Buttons (Continued)

Button	Output
LINE PLOT (Continued)	Closing a polygon: a terminal point preceded by several intermediate points & an initial point; when terminal point is transmitted, line is drawn from last intermediate to terminal & then from terminal to initial point
PLOTTER INITIALIZATION	Used to coordinate frame of photography & plotter; sets plotter origin & determines scale of plot
RELIEF PLOT	Line plot of object with corrections made for relief displacement
GEODETIC COORDINATES	Geodetic position of point transmitted
POINT PLOT	Plot of points; plotter will "dot" desired points; "dot" is very small L with vertex at transmitted point's position; after each terminal point is plotted, pen head returns to initial point of sequence
POINT LABEL	Identification of 2 points used for concurrent calculations; Special Character dials must be advanced for each point transmitted
CHARACTER SEQUENCE	Character designators for 2 points used for concurrent calculations; character designators are these: I = Initial N = Intermediate or Normal T = Terminal

OBTAINING MENSURAL OUTPUT

How to use the output function buttons and the transmission buttons to obtain mensural output is explained in Table 7. The calculations in column one are samples.

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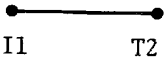
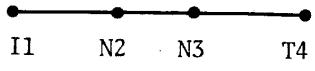
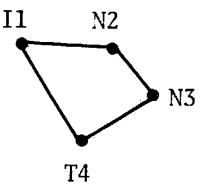
Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output

Calculation	Procedures	Mensural Output
Distance: between 2 consecutive points at ground level	Press DISTANCE button Transmit point 1 as initial point	----
	Transmit point 2 as terminal point	Distance between points 1 & 2
Distance: between series of points at ground level	Press DISTANCE button Transmit point 1 as initial point	----
	Transmit point 2 as intermediate point	Distance between points 1 & 2
or		
	Transmit point 3 as intermediate point	Distance between points 2 & 3
	Transmit point 4 as terminal point	Distance between points 3 & 4; distance between points 4 & 1

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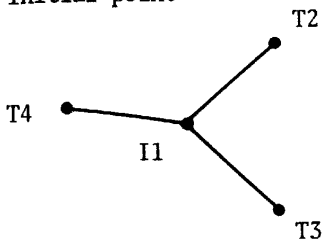
to Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
Distance: spoking; between 1 initial point & several terminal points; each terminal point used to calculate distance from initial point	Press DISTANCE button Transmit point 1 as initial point	----
	Transmit point 2 as terminal point	Distance between points 1 & 2
	Transmit point 3 as terminal point	Distance between points 1 & 3
	Transmit point 4 as terminal point	Distance between points 1 & 4
Azimuth: from true north of line between 2 consecutive points referenced at initial point; α = azimuth	Press AZIMUTH button Transmit point 1 as initial point	----
	Transmit point 2 as terminal point	Azimuth of points 1 & 2



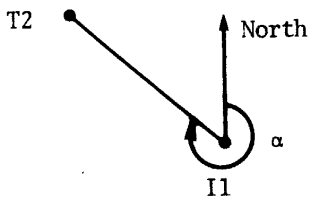


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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

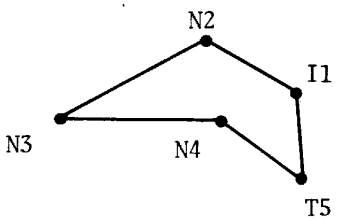
Calculation	Procedures	Mensural Output
Azimuth: of series of lines 	Press AZIMUTH button Transmit point 1 as initial point	----
	Transmit point 2 as intermediate point	Azimuth of line between points 1 & 2
	Transmit point 3 as intermediate point	Azimuth of line between points 2 & 3
	Transmit point 4 as intermediate point	Azimuth of line between points 3 & 4
	Transmit point 5 as terminal point	Azimuth of line between points 4 & 5 azimuth of line between points 5 & 1
Azimuth: spoking from center point to several other points	Press AZIMUTH button Transmit point 1 as initial point	----

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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

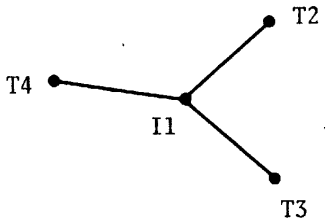
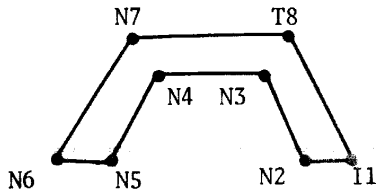
Calculation	Procedures	Mensural Output
Azimuth (Continued)	Transmit point 2 as terminal point	Azimuth of line between points 1 & 2
	Transmit point 3 as terminal point	Azimuth of line between points 1 & 3
	Transmit point 4 as terminal point	Azimuth of line between points 1 & 4
Area: of polygon	Press AREA button Transmit point 1 as initial point	----
	Proceeding clockwise or counterclockwise, transmit all corner points as intermediate points except point 8	----
	Transmit point 8 as terminal point	Area of polygon

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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
Relief height: vertical objects only; e.g., poles, walls, buildings, holes	Press RELIEF HEIGHT button	----
	Transmit point 1 as initial point; must represent bottom of structure or point nearest earth's surface	----
	Transmit point 2 as terminal point; must represent opposite end of structure, directly above or below point 1	Relief height of structure

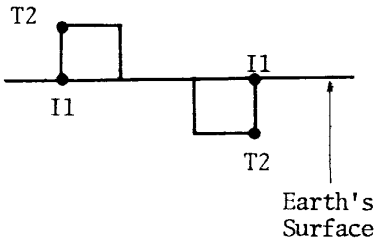

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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
M2 shadow height: Q-factor shadow height; vertical distances only; uses sun angle, solar azimuth, position of tip of object's shadow, & position of top of object to calculate height	Press M2 SHADOW HEIGHT button	----
	Transmit point 1 as initial point; must represent tip of vertical object's shadow	----
	Transmit point 2 as terminal point; must represent top of object corresponding to point on shadow sent as point 1	M2 shadow height of vertical object

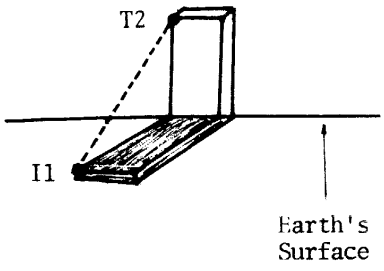

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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
M1 shadow height: shadow should be on level ground; shadows not on level ground will be projected to the horizontal at base of object; height of vertical objects only; solar elevation, position of tip of shadow, & position of base of shadow used to calculate height	Press M1 SHADOW HEIGHT button	----
	Transmit point 1 as initial point; must represent tip of object's shadow	----
	Transmit point 2 as terminal point; must be at base of shadow on a line parallel to edge of shadow transmitted as point 1	M1 shadow height of vertical object

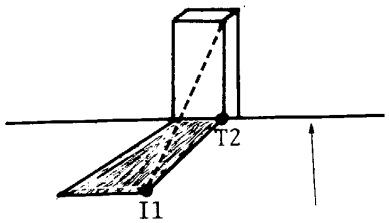

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Table 7. Using Transmission and Output Function Buttons to Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
Ground XYZ: of single point	Press GROUND XYZ button & transmit point	Coordinates of point in local coordinate system
CMC Echo: of single point	Press CMC ECHO button & transmit point	CMC coordinates of point transmitted
Point Label: Of 2 points in sequence of points	Press POINT LABEL button; set Special Character dials on electronic module to desired values; transmit sequence of points	Identification of 2 points of a sequence used for concurrent calculations
Character Sequence: of sequence of points	Press CHARACTER SEQUENCE button & transmit points	Character designators of points used for calculations
Geodetic Coordinates: of single point	Press GEODETIC COORDINATES buttons & transmit points	Latitude & longitude of point transmitted
Relief plot: for bldg with considerable relief displacement; roof to be shifted over base of bldg	Press LINE PLOT button & drive pen head to base of object by transmitting base as initial point	----

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Table 7. Using Transmission and Output Function Buttons To Obtain Mensural Output (Continued)

Calculation	Procedures	Mensural Output
Relief plot (Continued)	Release LINE PLOT button & press RELIEF PLOT button	----
	Transmit as an intermediate point top of object that corresponds to initial point transmitted for base	----
	After RELIEF PLOT READY message is printed on teletype, transmit all other points for which this relief displacement correction is necessary	Line plot with relief displacement correction made
	To do relief plotting with a different height or to use other plotting functions, release RELIEF PLOT button & press LINE PLOT or POINT PLOT button & continue plotting	
North arrow: on completed plot	With plotter drives, move pen head to unmarked area; press NORTH ARROW button & transmit any point as initial point	North arrow

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25X1 [redacted] PLOTTER

25X1 A [redacted] plotter is used with the Real-Time Mensuration Program to obtain a plot of objects discernible on film according to a specified scale and size. It can produce a plot up to 29.5 inches wide.

TURN-ON PROCEDURES

25X1 Turning a [redacted] plotter on involves these steps in the order listed.

1. Move the POWER dial to the ON position.
2. Move the CHART DRIVE dial to the ON position.
3. Move the PEN dial to the UP position and then release it.
4. Using the CARRIAGE FAST RUN dial, drive the pen head to the center of the drum.
5. Using the DRUM FAST RUN dial, supply the plotter with adequate paper.

INITIALIZING A PLOTTER

Before a plotter can be used with the RTMP, the photo-plot environment must be established, i.e., initialization must take place. To 25X1 initialize a [redacted] plotter, press the PLOTTER INITIALIZATION button and then follow these procedures in the order listed.

1. Draw the longest line segment that can be drawn through the area to be plotted.
2. Transmit the approximate center of the area to be plotted as an initial point. You will receive this

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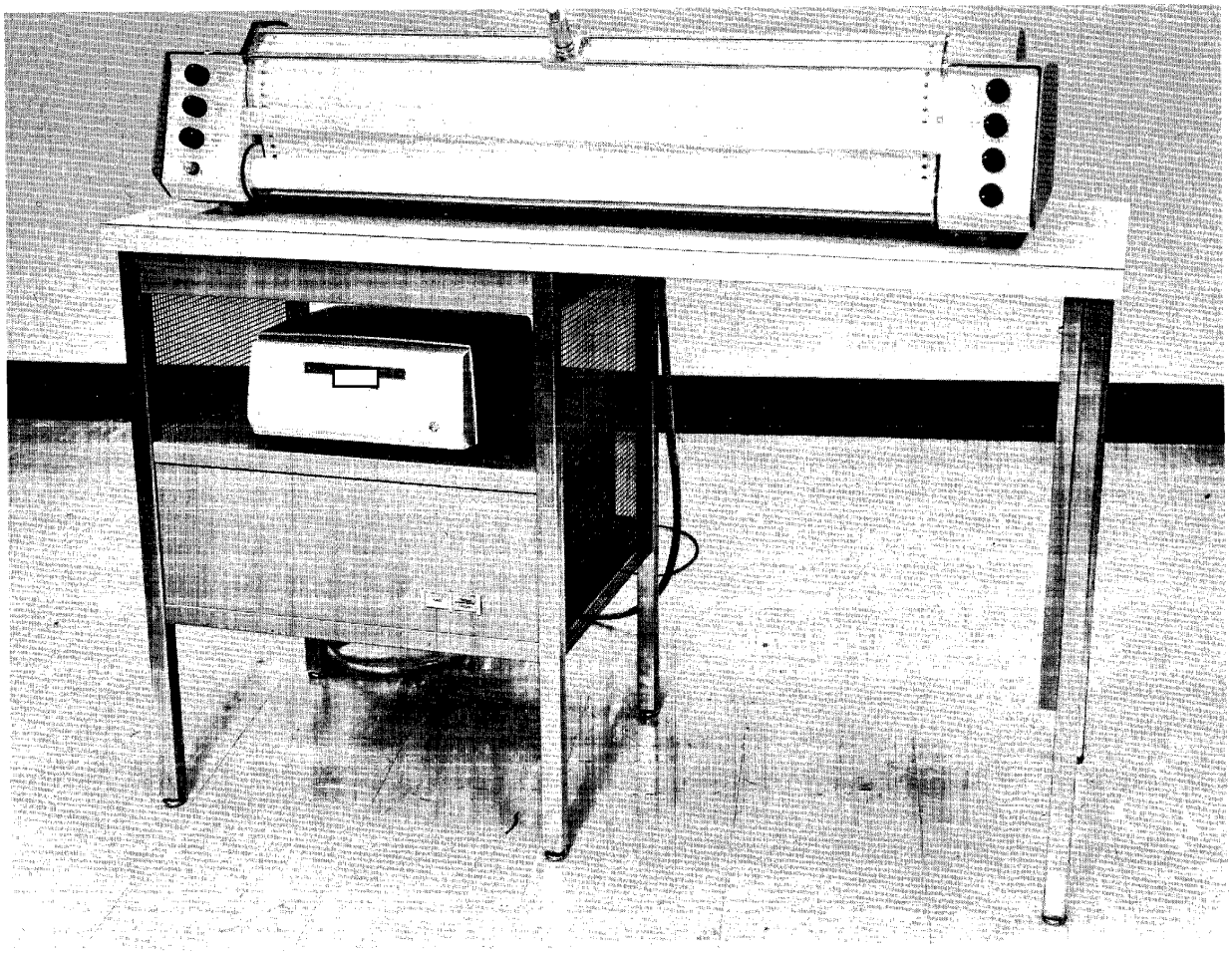

FIGURE 6. [redacted] PLOTTER.

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message via the teletype you are using:

ORIGIN SET--SEND FIRST IMAGE LIMIT

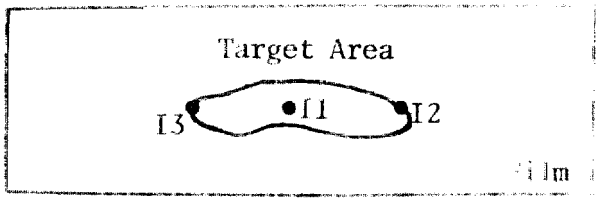
3. Transmit one end point of the line drawn as an initial point. You will receive this message:

SEND LAST IMAGE LIMIT

4. Transmit the other end point of the line as an initial point. You will receive this message:

PLOTTER INITIALIZED
SCALE = 1:XXXX

The scale is the scale of the rectified plot to be drawn. It is the ratio between the parameter entered for plot distance and the distance between the image limits on the plotter.



III

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CHAPTER III. PROCESSING PHOTOGRAPHY FROM THE KH-4A AND KH-4B CAMERA SYSTEMS

Using the Real-Time Mensuration Program to process photography derived from the KH-4A and KH-4B camera systems involves these steps in the order listed:

STEP 1 obtaining parameters

STEP 2 marking fiducials (or measuring grid coordinates)

STEP 3 initializing a teletype

STEP 4 submitting parameters

STEP 5 initializing a comparator

STEP 6 transmitting points for calculations

STEP 7 terminating frame operations

There are several options under which KH-4 photography may be processed. The options available are these:

K4A	frame of photography; KH-4A camera system
K4B	frame of photography; KH-4B camera system
K4BR	frame of photography; KH-4B camera system; MPF retrieval

AUP4B	frame of photography; KH-4B camera system: used when attitude parameters are not known
C4A	chip of photography; KH-4A camera system
C4B	chip of photography; KH-4B camera system
C4BR	chip of photography; KH-4B camera system; MPF retrieval

OBTAINING
PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film being processed, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before using the program, assemble all required parameters. These parameters and their sources are listed in Table 8. Most parameters appear in the Best-Fit Ephemeris.

Table 8. Parameters Needed for K4A Option

Parameters	Source
System name; K4A	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Focal length; millimeters	Best-Fit Ephemeris
Nadir latitude; degrees, minutes & direction	Best-Fit Ephemeris
Nadir longitude; degrees, minutes & direction	Best-Fit Ephemeris
Altitude; feet	Best-Fit Ephemeris
Elevation; of target area; positive if above sea level; feet	Maps & research material
Velocity; ground track; feet per second	Best-Fit Ephemeris

Table 8. Parameters Needed for K4A Option (Continued)

Azimuth; ground track; degrees & minutes	Best-Fit Ephemeris
Sun angle; degrees & minutes	Best-Fit Ephemeris
Solar azimuth; degrees & minutes	Best-Fit Ephemeris
Pitch; degrees & minutes	Best-Fit Ephemeris
Roll; degrees & minutes	Best-Fit Ephemeris
Yaw; degrees & minutes	Best-Fit Ephemeris
Scan rate; radians per second	Best-Fit Ephemeris
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MARKING
FIDUCIALS

Mount the film positive, emulsion side up, on a light table. There will be a small triangular jutting located between the date and the classification on the frame. Fiducial 1 will be the midpoint of the base of the triangle. Mark this point so that you can locate it again later. Fiducial 2 will be an arbitrary point along the format edge in the direction that the titling reads. See Figure 7, which appears at the end of this chapter.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced the photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	K4A
Press	RETURN key

You will then receive this message:

LOAD FILM EMULSION UP

Load the film positive, emulsion side up, on the comparator. The emulsion will be up when the film titling is readable. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter <u>each</u> parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111050

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME K4C↑A

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the

correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		K4A	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111052	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111050	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		K4A	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111052	
MISSION	XXXX-X	[redacted]	
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111050	RETURN key
MISSION	XXXX-X		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

Correcting an Entire Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 900000 or over, reset the counter to 000000.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will then receive the coordinates of fiducial 1 via the teletype. You will also receive this message:

SEND NEXT FIDUCIAL

Move the crosshairs about two to four inches to the right along the format edge. This point is fiducial 2. Transmit fiducial 2 by pressing the

FIDUCIAL button. You will receive the coordinates of fiducial 2 on the teletype. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS
FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter. 25X1

TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to

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begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time fiducials 1 and 2 were first terminated until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		K4A
LOAD FILM EMULSION UP		
PROJECT NUMBER	XXXXXX	111050
MISSION	XXXX-X	[redacted]
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
FOCAL LENGTH	XXX.XXX	111.111
NADIR LAT	XX-XX.XXZ	22-22.22N
NADIR LONG	XXX-XX.XXZ	111-11.11W
ALTITUDE	XXXXXXX	1111111
ELEVATION	SXXXXX	+01111
VELOCITY	XXXXX	11111
AZIMUTH	XXX-XX	111-11
SUN/	XX-XX	11-11
SOLAR AZ	XXX-XX	111-11

PITCH	SXX-XX	+11-11
ROLL	SXX-XX	-11-11
YAW	SXX-XX	+11-11
SCAN RATE	X.XXX	1.111
PLOT DIST	XX.X	09.0

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=- 0
Y FID=- 0

SEND NEXT FID

X FID=+ 90000
Y FID=+ 0

VIEWER INITIALIZED

LAT= 24D 29M 39.4S N
LONG= 110D 57M 28.8S W
CHAR SEQ= TO I

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 28,69 1332+

POINTING COUNT= 5 FILM DRIFT= 5.00 MICRONS

K4B OPTION

OETAINING
PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film being processed, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before using the program, assemble all required parameters. These parameters and their sources are listed in Table 9. Most parameters appear on the MPF listing for the mission and bucket from which the photography was derived.

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Table 9. Parameters Needed for K4B Option

Parameter	Source
System name; K4B	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Focal length; millimeters	MPF listing
Nadir latitude; degrees, minutes & direction	MPF listing
Nadir longitude; degrees, minutes & direction	MPF listing
Altitude; feet	MPF listing
Elevation; of target area; positive if above sea level; feet	Maps & research material
Velocity; feet per second	MPF listing
Azimuth; degrees & minutes	MPF listing
Sun angle; degrees & minutes	MPF listing

Table 9. Parameters Needed for K4B Option (Continued)

Solar azimuth; degrees & minutes	MPF listing
Pitch; degrees & minutes	MPF listing
Roll; degrees & minutes	MPF listing
Yaw; degrees & minutes	MPF listing
Scan rate; radians per second	MPF listing
Translation; microns	MPF listing
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MARKING
FIDUCIALS

Mount the film positive, emulsion side up, on a light table. Note the series of small white spots (rail holes) along the top of the frame. There will be two irregularities to this series of rail holes:

* binary block
  a small group of dots, some slightly raised from the rail holes line; indicates vehicle clock time

* center of format
  a pair of rail holes directly over the frame center

The Panoramic Geometry Stripe (PG Stripe) is a narrow white line on the frame's border about 0.01 inches from the format edge. Extend a line joining the two rail holes which are over the center of format until it intersects the inside edge of the PG Stripe. This intersection will be fiducial 1. With a pinpoint or by some other method, mark fiducial 1 so that it can be located again later. Fiducial 2 will be on the PG Stripe toward the titling of the frame. See Figure 8, which appears at the end of this chapter.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced that photography. To initialize a teletype follow these instructions in the order given.

Press & Release	ALT MODE key
Press	CTRL + U keys (simultaneously)

Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	K4B
Press	RETURN key

You will then receive this message:

LOAD FILM EMULSION UP

Load the film positive, emulsion side up, on a comparator. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter

S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111105

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME K4C↑B

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		K4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		K4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	[redacted]	
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

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Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

Correcting an Entire
Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame
Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING
A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will then receive the coordinates of

fiducial 1. You will also receive this message:

SEND NEXT FIDUCIAL

Move the crosshairs about two to four inches to the right along the PG Stripe. This point is fiducial 2. Transmit fiducial 2 by pressing the FIDUCIAL button. You will receive the coordinates of fiducial 2 on the teletype. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS
FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

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TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The point count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time fiducials 1 and 2 were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		K4B
LOAD FILM EMULSION UP		
PROJECT NUMBER	XXXXXX	111105
MISSION	XXX-X	[redacted]
PASS	XXXZ	111A
FRAME	XXX	111
CAMERA A OR F	Z	A
FOCAL LENGTH	XXX.XXX	609.000
NADIR LAT	XX-XX.XXZ	09-09.09N
NADIR LONG	XXX-XX.XXZ	090-00.09W

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ALTITUDE	XXXXXXX	0700000
ELEVATION	SXXXXX	+09090
VELOCITY	XXXXX	25000
AZIMUTH	XXX-XX	080-00
SUN/	XX-XX	08-09
SOLAR AZ	XXX-XX	088-00
PITCH	SXX-XX	+09-00
ROLL	SXX-XX	-02-33
YAW	SXX-XX	+00-09
SCAN RATE	X.XXX	4.400
TRANSLATION	XXXXX	30000
PLOT DIST	XX.X	20.0

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 109
Y FID=+ 2000

SEND NEXT FID

X FID=+ 1000
Y FID=+ 1000

VIEWER INITIALIZED

GROUNDX= 29111.7 FT
GROUNDY= 74890.0 FT
GROUNDZ= -691154.4 FT

LAT= 23D 31M 50.1S S
LONG= 122D 43M 3.3S E

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 25,69 1559

POINTING COUNT= 5 FILM DRIFT= 6.00 MICRONS

OBTAINING
PARAMETERS

Except for the parameters available from the MPF, you will be responsible for obtaining the parameters needed for each use of the program. These parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional. Before you use the program, assemble all required parameters. These parameters and their sources are listed in Table 10.

Table 10. Parameters Needed for K4BR Option

Parameter	Source
System name; K4BR	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass Number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Elevation; of target area; positive if above sea level; feet	Maps & research material
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

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MARKING
FIDUCIALS

Mount the film positive, emulsion side up, on a light table. Note the series of small white spots (rail holes) along the top of the frame. There will be two irregularities to this series of rail holes:

* binary block
  a small group of dots, some slightly raised from the rail holes line; indicates vehicle clock time

* center of format
  a pair of rail holes directly over the frame center

The Panoramic Geometry Stripe (PG Stripe) is a narrow white line on the frame's border about 0.01 inches from the format edge. Extend a line joining the two rail holes which are over the center of format until it intersects the inside edge of the PG Stripe. This intersection will fiducial 1. With a pinpoint or by some other method, mark fiducial 1 so that it can be located again later. Fiducial 2 will be on the PG Stripe toward the titling of the frame. See Figure 8, which appears at the end of this chapter.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced that photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)

Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	K4BR
Press	RETURN key

You will then receive this message:

LOAD FILM EMULSION UP

Load the film positive, emulsion side up, on a comparator. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter

S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111105

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME K4BT↑R

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		K4BR	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		K4BR	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	[redacted]	25X1
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

Correcting an Entire
Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame
Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING
A COMPARATOR

After you have submitted your parameters and the MPF retrieval has been successfully completed, you will receive one of the following two messages:

* READY W SR-SEND FIRST FIDUCIAL
  appears if stellar-derived attitude
  of pan camera is available, or

* READY W/O SR-SEND FIRST FIDUCIAL
  appears if stellar-derived attitude
  of pan camera is not available

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will then receive the coordinates of fiducial 1. You will also receive this message:

SEND NEXT FIDUCIAL

Move the crosshairs about two to four inches to the right along the PG Stripe. This point is fiducial 2. Transmit fiducial 2 by pressing the FIDUCIAL button. You will receive the coordinates of fiducial 2 on the teletype. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.
2. Press the appropriate output function buttons for the calculations you want.
3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

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TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time fiducials 1 and 2 were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		K4DR
LOAD FILM EMULSION UP		
PROJECT NUMBER	XXXXXX	111105
MISSION	XXXX-X	
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
ELEVATION	SXXXXX	+09090
PLOT DISTANCE	XX.X	20.0

READY W/O SR-SEND 1ST FID

X FID=+ 109
Y FID=+ 2000

SEND NEXT FID

X FID=+ 200
Y FID=+ 200000

VIEWER INITIALIZED

LAT= 20D 14M 40.3S N
LONG= 110D 11M 35.8S W

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 25,69 1559

POINTING COUNTS= 5 FILM DRIFT= 210276.50 MICRONS

AUP4B OPTION

The AUP4B option is used for KH-4B photography only. This option may be used when the attitude parameters for a frame are not known, but certain control information is known. The following information must be known:

* the latitude and longitude of some photographed area
* the azimuth of a line drawn from the point defined by the given latitude and longitude

OBTAINING PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional. Before you use the program, assemble all required parameters. These parameters and their sources are listed in Table 11. Most parameters appear on the MPF listing for the mission and bucket from which the film was derived.

Table 11. Parameters Needed for AUP4B Option

Parameter	Source
System name; AUP4B	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Focal length; of camera; millimeters	MPF listing
Nadir latitude; at film exposure time; degrees, minutes & direction	MPF listing
Nadir longitude; at film exposure time; degrees, minutes & direction	MPF listing
Altitude; of vehicle; above mean sea level; feet	MPF listing
Elevation; of target area; positive if above mean sea level; feet	Maps & research material
Velocity; of vehicle at exposure time; feet per second	MPF listing

Table 11. Parameters Needed for AUP4B Option (Continued)

Azimuth; of vehicle at exposure time; degrees & minutes	MPF listing
Sun angle; solar elevation; degrees & minutes	MPF listing
Solar azimuth; degrees & minutes	MPF listing
Scan rate; inches per second	MPF listing
Translation; distance from principal point to fiducial 1; microns	MPF listing
Control latitude; of some discernible control point on frame; degrees, minutes & direction	Must be known
Control longitude; of same control point; degrees, minutes & direction	Must be known
Control azimuth; of line from point defined by control latitude & longitude; degrees & minutes	Must be known
Plot distance; optional; distance in inches on plotter; for plotter initialization; used with image limits to determine scale	To meet your specifications

MARKING
FIDUCIALS

Mount the film positive, emulsion side up, on a light table. Note the series of small white spots (rail holes) along the top of the frame. There will be two irregularities to this series of rail holes:

* binary block
  a small group of dots, some slightly raised from the rail holes line; indicates vehicle clock time

* center of format
  a pair of rail holes directly over the frame center

The Panoramic Geometry Stripe (PG Stripe) is a narrow white line on the frame's border about 0.01 inches from the format edge. Extend a line joining the two rail holes which are over the center of format until it intersects the inside edge of the PG Stripe. This intersection will be fiducial 1. With a pinpoint or by some other method, mark fiducial 1 so that it can be located again later. Fiducial 2 will be on the PG Stripe toward the titling of the frame. See Figure 8, which appears at the end of this chapter.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced that photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)

Type	INIT
Press	RETURN key

You will then receive this message on the teletype

ENTER SYSTEM NAME

Next,

Type	AUP4B
Press	RETURN key

You will then receive this message:

LOAD FILM EMULSION UP

Load the film positive, emulsion side up, on a comparator. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter

S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111105

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME AUP4C↑B

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		AUP4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		AUP4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	[redacted]	25X1
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

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Correcting an Entire Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 900000 or over, reset the counter to 000000.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over fiducial 1. Transmit fiducial 1 to the

program by pressing the FIDUCIAL button. You will then receive the coordinates of fiducial 1. You will also receive this message:

SEND NEXT FIDUCIAL

Move the crosshairs about two to four inches to the right along the PC Stripe. This point is fiducial 2. Transmit fiducial 2 by pressing the FIDUCIAL button. You will receive the coordinates of fiducial 2 on the teletype. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING
CONTROL POINTS

You are now ready to transmit the control points. Move the crosshairs to the point defined by the control latitude and the control longitude. Transmit this point as an initial point. You will receive this message:

IMAGE CONTROL PT REC'D--SEND IMAGE CONTROL AZ

Move the crosshairs along the line defined by the control azimuth. The greater the distance between the point for image control and the point for image control azimuth, the better the chances are for an accurate azimuth reading. Transmit this point as an initial point. You will receive this message:

PITCH = XX.XXX DEG
ROLL = XX.XXX DEG
YAW = XX.XXX DEG

READY FOR K4B MEASUREMENT

These calculated angles comprise the camera attitude for this frame.

TRANSMITTING POINTS
FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.
2. Press the appropriate output function buttons for the calculations you want.
3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter. 25X1

TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to

begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time fiducials 1 and 2 were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		AUP4B
LOAD FILM EMULSION UP		
PROJECT NUMBER	XXXXXX	111105
MISSION	XXXX-X	
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
FOCAL LENGTH	XXX.XXX	609.000
NADIR LAT	XX-XX.XXZ	09-09.09N
NADIR LONG	XXX-XX.XXZ	090-00.09E
ALTITUDE	XXXXXXX	0700000
ELEVATION	SXXXXX	+09000
VELOCITY	XXXXX	25000
AZIMUTH	XXX-XX	080-00
SUN/	XX-XX	08-09
SOLAR AZ	XXX-XX	088-00
SCAN RATE	X.XXX	4.000

25X1

TRANSLATION	XXXXX	30000
CONTROL LAT	XX-XX.XXZ	09-06.50N
CONTROL LONG	XXX-XX.XXZ	090-13.20E
CONTROL AZ	XXX-XX	170-15
PLOT DIST	XX.X	00.0

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 0
Y FID=+ 0

SEND NEXT FID

X FID=+ 1000
Y FID=+ 1000

VIEWER INITIALIZED

IMAGE CONTRL PT REC'D--SEND IMAGE CONTRL AZ

PITCH= 9.002 DEG
ROLL= -2.544 DEG
YAW= 0.111 DEG

READY FOR K4B MEASUREMENT

GROUNDX= 29086.5 FT
GROUNDY= 74890.5 FT
GROUNDZ= -691154.4 FT

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB 28,70 1332+

POINTING COUNT= 6 FILM DRIFT= 5.00 MICRONS

C4A OPTION

OBTAINING
PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film being processed, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before using the program, assemble all required parameters. These parameters and their sources are listed in Table 12. Most parameters appear in the Best-Fit Ephemeris.

Table 12. Parameters Needed for C4A Option

Parameter	Source
System name; C4A	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Focal length; millimeters	Best-Fit Ephemeris
Nadir latitude; degrees, minutes & direction	Best-Fit Ephemeris
Nadir longitude; degrees, minutes & direction	Best-Fit Ephemeris
Altitude; feet	Best-Fit Ephemeris
Elevation; of target area; positive if above sea level; feet	Maps & research material
Velocity; ground track; feet per second	Best-Fit Ephemeris
Azimuth; ground track; degrees & minutes	Best-Fit Ephemeris

Table 12. Parameters Needed for C4A Option (Continued)

Sun angle; degrees & minutes	Best-Fit Ephemeris
Solar azimuth; degrees & minutes	Best-Fit Ephemeris
Pitch; degrees & minutes	Best-Fit Ephemeris
Roll; degrees & minutes	Best-Fit Ephemeris
Yaw; degrees & minutes	Best-Fit Ephemeris
Scan rate; radians per second	Best-Fit Ephemeris
First grid; x & y grid coordinates of first grid endpoint; centimeters	You measure & record
Second grid; x & y coordinates of second grid endpoint; centimeters	You measure & record
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MEASURING GRID
COORDINATES

Mount the film positive, emulsion side up, on a light table. There will be a small triangular jutting located between the date and the classification on the frame; this is the center fiducial. To measure the grid coordinates, place a Universal Grid Number 2 over or under the frame so that the grid numbers read correctly. Position the grid so that

* the triangle above the X = 46 line covers the center fiducial, and

* the small dash lines at Y = 14.8 are along the top format edge of the frame

These two conditions should be met as closely as possible. However, because of film deformation, absolute congruency is not always feasible. With a pinpoint or by some other method, mark the end points of the longest line segment (usually diagonal) that can be drawn through the target area. These points must fall on grid intersections. Record the grid coordinates of each of the two end points and note the order in which you recorded them. Cut the chip from the frame.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced the photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)

Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	C4A
Press	RETURN key

You will then receive this message:

LOAD CHIP EMULSION UP

Load the film positive, emulsion side up, on the comparator. Procedures for placing the chips can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

25X1

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111050

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME C4C↑A

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		C4A	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111052	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111050	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		C4A	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111052	
MISSION	XXXX-X	[redacted]	25X1
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	11050	RETURN key
MISSION	XXXX-X		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

25X1

Correcting an Entire Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit the grid points to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over the point entered as the first grid. Transmit this point to the program by pressing the FIDUCIAL button.

You will then receive the coordinates of this grid point on the teletype. You will also receive this message:

SEND NEXT FIDUCIAL

Position the crosshairs over the point entered as the second grid. Transmit this point to the program by pressing the FIDUCIAL button. You will receive the coordinates of this grid point. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS
FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over the first grid point. Press the FUDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including grid points. Film drift is the distance the film has moved at the first grid point from the time the grid points were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		C4A
LOAD CHIP EMULSION UP		
PROJECT NUMBER	XXXXXX	111050
MISSION	XXXX-X	[redacted]
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
FOCAL LENGTH	XXX.XXX	600.000
NADIR LAT	XX-XX.XXZ	11-11.55S
NADIR LONG	XXX-XX.XXZ	111-22.33W

25X1

ALTITUDE	XXXXXXX	0222222
ELEVATION	SXXXXX	-11111
VELOCITY	XXXXX	11111
AZIMUTH	XXX-XX	111-11
SUN/	XX-XX	22-22
SOLAR AZ	XXX-XX	122-22
PITCH	SXX-XX	+01-11
ROLL	SXX-XX	+03-22
YAW	SXX-XX	-08-11
SCAN RATE	X.XXX	1.222
FIRST GRID	XX-XX	01-11
SECOND GRID	XX-XX	11-13
PLOT DIST	XX.X	11.1

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 90000
Y FID=+ 0

SEND NEXT FID

X FID=+ 90000
Y FID=+ 100000

VIEWER INITIALIZED

CMCX= 0.00 MICRONS= 0 COUNTS
CMCY= 0.00 MICRONS= 0 COUNTS
LAT= 10D 38M .6S S
LONG= 110D 52M 48.7S W
CHAR SEQ = TO I

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 28,69 1328

POINTING COUNT= 5 FILM DRIFT= 0.00 MICRONS

C4B OPTION

OBTAINING
PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film being processed, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before using the program, assemble all required parameters. These parameters and their sources are listed in Table 13. Most parameters appear on the MPF listing for the mission and bucket from which the photography was derived.

Table 13. Parameters Needed for C4B Option

Parameter	Source
System name; C4B	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F; A for aft looking camera; F for forward looking camera	Film
Focal length; millimeters	MPF listing
Nadir latitude; degrees, minutes & direction	MPF listing
Nadir longitude; degrees, minutes & direction	MPF listing
Altitude; feet	MPF listing
Elevation; of target area; positive if above sea level; feet	Maps & research material
Velocity; feet per second	MPF listing
Azimuth; degrees & minutes	MPF listing
Sun angle; degrees & minutes	MPF listing

Table 13. Parameters Needed for C4B Option (Continued)

Solar azimuth; degrees & minutes	MPF listing
Pitch; degrees & minutes	MPF listing
Roll; degrees & minutes	MPF listing
Yaw; degrees & minutes	MPF listing
Scan rate; radians per second	MPF listing
First grid; x & y grid coordinates of first grid endpoint; centimeters	You measure & record
Second grid; x & y coordinates of second grid endpoint; centimeters	You measure & record
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MEASURING GRID
COORDINATES

Mount the film positive, emulsion side up, on a light table. To measure the grid coordinates, place a Universal Grid Number 4-T over or under the frame so that the grid numbers read correctly. Align the grid so that

* the x = 0 line is along the left format edge, and
* the y = 0 line is along the bottom format edge

With a pinpoint or by some other method, mark the end points of the longest line segment (usually diagonal) that can be drawn through the target area. These end points must fall on grid intersections. Record the grid coordinates of these two points and note the order in which you recorded them. Cut the chip from the frame.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced the photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	C4B
Press	RETURN key

You will then receive this message:

LOAD CHIP EMULSION UP

Load the film positive, emulsion side up, on the comparator. Procedures for placing the chips can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after

you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111105

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME C4C↑B

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example:

ENTER SYSTEM NAME		C4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		C4B	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	[redacted]	
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

Correcting an Entire
Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame
Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING
A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit the grid points to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over the point entered as the first grid. Transmit this point to the program by pressing the FIDUCIAL button.

You will then receive the coordinates of this grid point on the teletype. You will also receive this message:

SEND NEXT FIDUCIAL

Position the crosshairs over the point entered as the second grid. Transmit this point to the program by pressing the FIDUCIAL button. You will receive the coordinates of the second grid point. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS
FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over the first grid point. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINT COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including grid points. Film drift is the distance the film has moved at the first grid point from the time the grid points were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		C4B
LOAD CHIP EMULSION UP		
PROJECT NUMBER	XXXXXX	111105
MISSION	XXXX-X	
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
FOCAL LENGTH	XXX.XXX	222.222
NADIR LAT	XX-XX.XXZ	22-22.22S
NADIR LONG	XXX-XX.XXZ	122.22.22W

ALTITUDE	XXXXXXX	1111111
ELEVATION	SXXXXX	+00101
VELOCITY	XXXXX	11011
AZIMUTH	XXX-XX	001-22
SUN/	XX-XX	11-11
SOLAR AZ	XXX-XX	111-11
PITCH	SXX-XX	-11-11
ROLL	SXX-XX	-12-12
YAW	SXX-XX	+00-11
SCAN RATE	X.XXX	1.112
FIRST GRID	XX-XX	00-02
SECOND GRID	XX-XX	11-19
PLOT DIST	XX.X	28.0

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 0
Y FID=+ 0

SEND NEXT FID

X FID=+ 90000
Y FID=+ 100000

VIEWER INITIALIZED

CMCX= 0.00 MICRONS= 0 COUNTS
CMCY= 100000.00 MICRONS= 100000 COUNTS
LAT= 19D 52M 47.2S S
LONG= 129D 5M 51.7S W
CHAR SEQ= TO I

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 28,69 1332+

POINTING COUNT= 5 FILM DRIFT= 0.00 MICRONS

C4ER OPTION

OBTAINING PARAMETERS

Except for the parameters available from the MPF, you will be responsible for obtaining the parameters needed for each use of the program. These parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional. Before you use the program, assemble all required parameters. These parameters and their sources are listed in Table 14.

Table 14. Parameters Needed for C4BR Option

Parameter	Source
System name; C4BR	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Mission number	Film
Pass number	Film
Frame number	Film
Camera A or F: A for aft looking camera; F for forward looking camera	Film
Elevation; of target area; positive if above sea level; feet	Maps & research material
First grid; x & y grid coordinates of first grid endpoint; centimeters	You measure & record
Second grid; x & y grid coordinates of second grid endpoint; centimeters	You measure & record
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MEASURING GRID
COORDINATES

Mount the film positive, emulsion side up, on a light table. To measure the grid coordinates, place a Universal Grid Number 4-E over or under the frame so that the grid numbers read correctly. Align the grid so that

* the x = 0 line is along the left format edge, and

* the y = 0 line is along the bottom format edge

With a pinpoint or by some other method, mark the end points of the longest line segment (usually diagonal) that can be drawn through the target area. These end points must fall on grid intersections. Record the grid coordinates of these two points and note the order in which you recorded them. Cut the chip from the frame.

INITIALIZING
A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed and the camera system that produced the photography. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL & U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	C4BR
Press	RETURN key

You will then receive this message:

LOAD CHIP EMULSION UP

Load the film positive, emulsion side up, on the comparator. Procedures for placing the chips can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after

you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 111105

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

Correcting Characters

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME C4IT↑R

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

Correcting Lines

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		C4ER	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		C4ER	
LOAD FILM			
PROJECT NUMBER	XXXXXX	111106	
MISSION	XXXX-X	[redacted]	
PASS	XXXZ	DELET	RETURN key
MISSION	XXXX-X	DELET	RETURN key
PROJECT NUMBER	XXXXXX	111105	RETURN key
MISSION	XXXX-X		

25X1

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

Correcting an Entire Parameter List

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

Terminating Frame Operations

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted your parameters and the MPF retrieval has been successfully completed, you will receive one of the following two messages:

* READY W SR-SEND FIRST FIDUCIAL
  appears if stellar-derived attitude of pan camera is available, or

* READY W/O SR-SEND FIRST FIDUCIAL
  appears if stellar-derived attitude of pan camera is not available

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit the grid points to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over the point entered as the first grid. Transmit this point to the program by pressing the FIDUCIAL button. You will then receive the coordinates of this grid point on the teletype. You will also receive this message:

SEND NEXT FIDUCIAL

Position the crosshairs over the point entered as the second grid. Transmit this point to the program by pressing the FIDUCIAL button. You will receive the coordinates of the second grid point. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.
2. Press the appropriate output function buttons for the calculations you want.
3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

25X1

TERMINATING FRAME
OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over the first grid point. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINT COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including grid points. Film drift is the distance the film has moved at the first grid point from the time the grid points were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE
OUTPUT

ENTER SYSTEM NAME		C4BR
LOAD FILM EMULSION UP		
PROJECT NUMBER	XXXXXX	111105
MISSION	XXXX-X	
PASS	XXXZ	
FRAME	XXX	
CAMERA A OR F	Z	
ELEVATION	SXXXXX	+00101
FIRST GRID	XX-XX	00-02
SECOND GRID	XX-XX	11-19
PLOT DISTANCE	XX.X	28.0

READY W/O SR-SEND 1ST FID

X FID=+ 0
Y FID=+ 0

SEND NEXT FID

X FID=+ 1679
Y FID=+ 8562

VIEWER INITIALIZED

LAT= 5D 20M 42.3S S
LONG= 170D 13M 16.3S E

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB 25,69 1559

POINTING COUNT= 5 FILM DRIFT= 210276.50 MICRONS

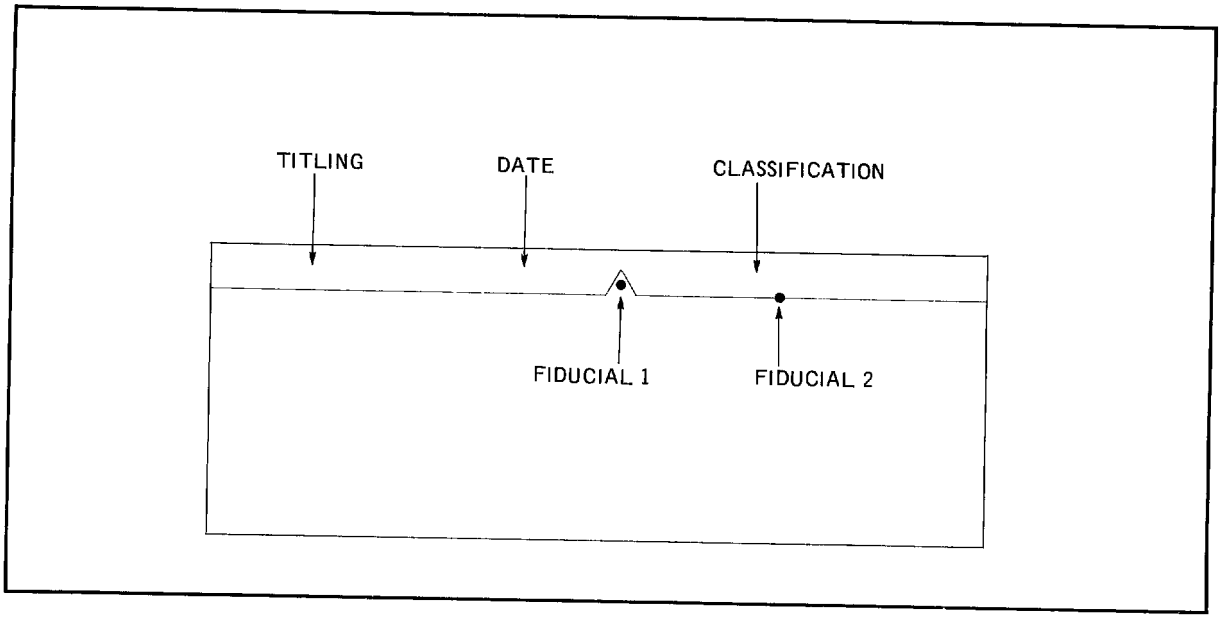

FIGURE 7. MARKING FIDUCIALS ON KH-4A PHOTOGRAPHY, EMULSION SIDE UP.

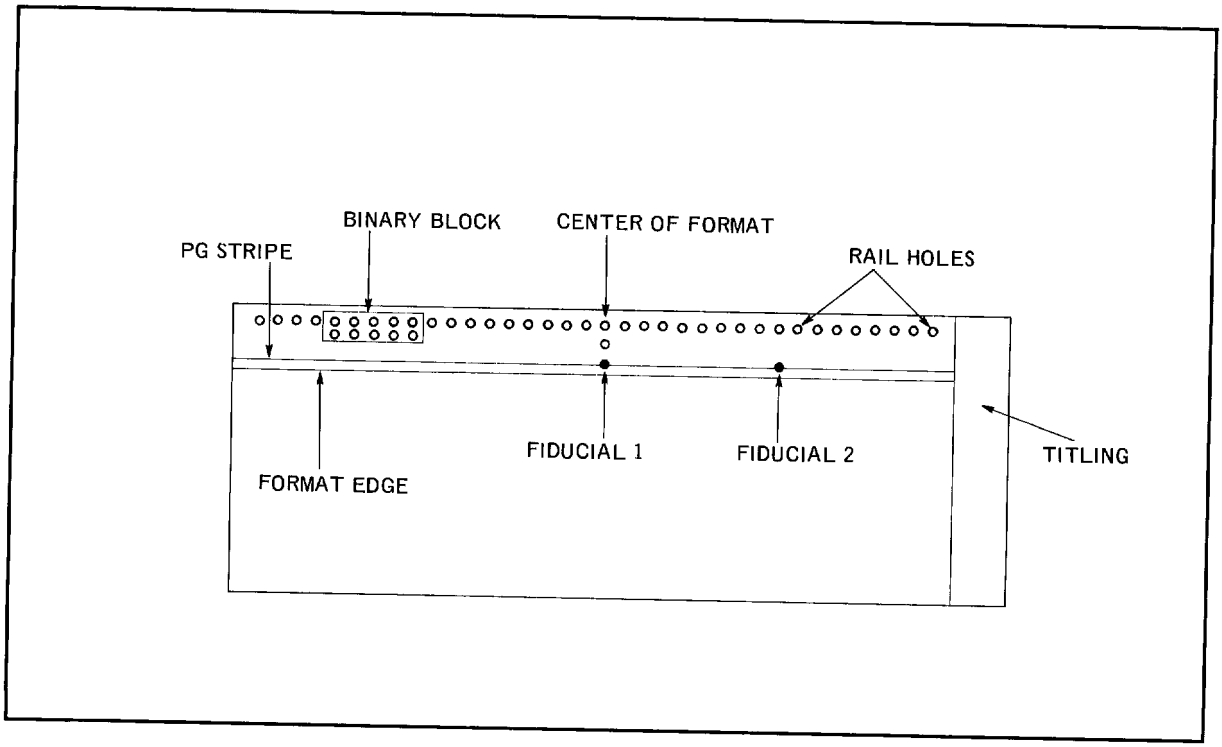

FIGURE 8. MARKING FIDUCIALS ON KH-4B PHOTOGRAPHY, EMULSION SIDE UP.

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CHAPTER VII. PROCESSING PANORAMIC PHOTOGRAPHY

You may use this general option (PAN) for processing photography from any panoramic camera system. Using the Real-Time Mensuration Program to process photography under this option involves these steps in the order listed.

STEP 1 obtaining parameters

STEP 2 marking fiducials

STEP 3 initializing a teletype

STEP 4 submitting parameters

STEP 5 initializing a comparator

STEP 6 transmitting points for calculations

STEP 7 terminating frame operations

OBTAINING PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before you use the program, assemble all required parameters. These parameters and some of their sources are listed in Table 28. Because of the wide range of photography that can be used with this option, all sources do not appear in the table. You must determine the best source where no source is provided.

Table 28. Parameters Needed for PAN Option

Parameter	Source
System name; PAN	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
First fiducial x; x coordinate of first grid intersection; millimeters	You measure & record
First fiducial y; y coordinate of first grid intersection; millimeters	You measure & record
Second fiducial x; x coordinate of second grid intersection; millimeters	You measure & record
Second fiducial y; y coordinate of second grid intersection; millimeters	You measure & record
Third fiducial x; x coordinate of third grid intersection; millimeters	You measure & record
Third fiducial y; y coordinate of third grid intersection; millimeters	You measure & record
Focal length; millimeters	----
IMC constant	----

Table 28. Parameters Needed for PAN Option (Continued)

IMC type; R for rotational, T for translational	This manual
Pitch; attitude relative to ground track; degrees & minutes	----
Roll; attitude relative to ground track; degrees & minutes	----
Yaw; attitude relative to ground track; degrees & minutes	----
Order; of rotation; Y=yaw, P=pitch, R=roll; enter correct letter combination	This manual
Scan rate; radians per second	----
Altitude; above mean sea level; feet	----
Elevation; of target area; positive if above sea level; feet	Maps & research material
Velocity; feet per second	----
Azimuth; ground track; angular measurement; degrees & minutes	----
Latitude; of nadir; angular measurement; degrees, minutes & direction	----
Longitude; of nadir; angular measurement; degrees, minutes & direction	----
Sun angle; degrees & minutes	----

Table 28. Parameters Needed for PAN Option (Continued)

Solar azimuth; degrees & minutes	----
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MARKING FIDUCIALS

One method of marking fiducials is presented here; other methods can be found which are equally good. Mount the film positive, emulsion side up, on a light table. Place a Universal Grid Number 2 over or under the film so that

* the X = 46 and Y = 12 grid intersection is aligned with the principal point of the film
* the grid lines are parallel to the format edges of the film
* the positive Y axis is in the direction of flight

With a pinpoint or by some other method, mark three points on the film at non-colinear grid intersections. Two to four inches between points is sufficient. These three points will be fiducials 1, 2, and 3, respectively.

Next,

* subtract 46 from each X value
* subtract 12 from each Y value
* multiply each grid coordinate by ten to convert it from centimeters to millimeters

The resultant values will be used as parameters. (See Table 28.)

INITIALIZING A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	PAN
Press	RETURN key

You will then receive this message:

LOAD FILM

Load the film positive on the comparator. The emulsion may be either up or down. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 920022

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

CORRECTING CHARACTERS

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the

correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME PAM↑N

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

CORRECTING LINES

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		PAN	
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
1ST FID. X	SXXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
1ST FID. X	SXXX.XXX		

you may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		PAN	
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
1ST FID. X	SXXX.XXX	+000.000	
1ST FID. Y	SXXX.XXX	DELET	RETURN key
1ST FID. X	SXXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
1ST FID. X	SXXX.XXX		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

CORRECTING AN ENTIRE PARAMETER LIST

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

TERMINATING FRAME OPERATIONS

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the crosshairs over the point marked earlier as fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 1 and this message:

SEND NEXT FID

Place the crosshairs over fiducial 2. Transmit fiducial 2 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 2 and this message:

SEND NEXT FID

Place the crosshairs over fiducial 3. Transmit fiducial 3 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 3 and this message:

VIEWER INITIALIZED

TRANSMITTING POINTS FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.
2. Press the appropriate output functions buttons for the calculations you want.
3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter.

25X1

TERMINATING FRAME OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time the fiducials were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE OUTPUT

ENTER SYSTEM NAME		PAN
LOAD FILM		
PROJECT NUMBER	XXXXXX	920022
1ST FID. X	SXXX.XXX	+000.000
1ST FID. Y	SXXX.XXX	+000.000
2ND FID. X	SXXX.XXX	+111.111
2ND FID. Y	SXXX.XXX	+111.000
3RD FID. X	SXXX.XXX	-090.000
3RD FID. Y	SXXX.XXX	-088.000
FOCAL LENGTH	XXXX.XXX	0600.000
IMC CONSTANT	SXXXX.XXXX	+0123.0090
IMC TYPE	Z	T
PITCH	SXX-XX	+09-09
ROLL	SXX-XX	-08-00
YAW	SXX-XX	+00-55
ORDER	ZZZ	YPR
SCAN RATE	SXX.XXX	+06.099
ALTITUDE	XXXXXXX	0700000
ELEVATION	SXXXXX	+00900

VELOCITY	XXXXX	25000
AZIMUTH	XXX-XX.X	009-09.0
LATITUDE	XX-XX.XXZ	09-09.09N
LONGITUDE	XXX-XX.XXZ	009-09.09E
SUN ANGLE	XX-XX	23-00
SOLAR AZ	XXX-XX	111-33
PLOT DIST	XX.X	20.5

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 0
Y FID=+ 0

SEND NEXT FID

X FID=+ 111111
Y FID=+ 111000

SEND NEXT FID

X FID=- 90000
Y FID=+ 88000

VIEWER INITIALIZED

AZ= 92.33 DEG

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 25,69 1559

POINTING COUNTS= 6 FILM DRIFT= 0.00 MICRONS

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TOP SECRET

CHAPTER VIII. PROCESSING FRAME PHOTOGRAPHY

You may use the general FRAME option for processing phototography from any frame camera system. Using the Real-Time Mensuration Program to process photography under this option involves these steps in the order listed.

STEP 1 obtaining parameters

STEP 2 marking fiducials

STEP 3 initializing a teletype

STEP 4 submitting parameters

STEP 5 initializing a comparator

STEP 6 transmitting points for calculations

STEP 7 terminating frame operations

OBTAINING PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before you use the program, assemble all required parameters. These parameters and some of their sources are listed in Table 29. Because of the wide range of photography that can be used with this option, all sources do not appear in the table. You must determine the best source where no source is provided.

Table 29. Parameters Needed for FRAME Option

Parameter	Source
System name; FRAME	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
First fiducial x; x coordinate of first grid intersection; millimeters	You measure & record
First fiducial y; y coordinate of first grid intersection; millimeters	You measure & record
Second fiducial x; x coordinate of second grid intersection; millimeters	You measure & record
Second fiducial y; y coordinate of second grid intersection; millimeters	You measure & record
Third fiducial x; x coordinate of third grid intersection; millimeters	You measure & record
Third fiducial y; y coordinate of third grid intersection; millimeters	You measure & record
Focal length; millimeters	- - - -
Pitch; attitude relative to ground track; degrees & minutes	- - - -
Roll; attitude relative to ground track; degrees & minutes	- - - -

Table 29. Parameters Needed for FRAME Option (Continued)

Yaw; attitude relative to ground track; degrees & minutes	- - - -
Order; of rotation; Y=yaw, P=pitch R=roll; enter correct letter combination	This manual
Altitude; above mean sea level; feet	- - - -
Elevation; of target area; positive if above sea level; feet	Map & research material
Velocity; feet per second	- - - -
Azimuth; ground track; angular measurement; degrees & minutes	- - - -
Latitude; angular measurement; degrees, minutes & direction	- - - -
Longitude; angular measurement; degrees, minutes & direction	- - - -
Sun angle; degrees & minutes	- - - -
Solar azimuth; degrees & minutes	- - - -
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications

MARKING FIDUCIALS

One method of marking fiducials is presented here; other methods, which are equally good, can also be used. Mount the film positive, emulsion side up, on a light table. Place a Universal Grid Number 2 over or under the film so that

* the X = 46 and Y = 12 grid intersection is aligned with the principal point of the film
* the grid lines are parallel to the format edges of the film
* the positive Y axis is in the direction of flight

With a pinpoint or by some other method, mark three points on the film at non-colinear grid intersections. Two to four inches between points is sufficient. These three points will be fiducials 1, 2, and 3, respectively. Next,

* subtract 46 from each X value
* subtract 12 from each Y value
* multiply each grid coordinate by ten to convert it from centimeters to millimeters

The resultant values will be used as parameters. (See Table 29.)

INITIALIZING A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program

the type of photography to be processed. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	FRAME
Press	RETURN key

You will then receive this message:

LOAD FILM

Load the film positive on the comparator. The emulsion may be either up or down. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format

of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 920022

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you mark an error(s) while submitting parameters, follow the appropriate set of instructions.

CORRECTING CHARACTERS

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME FRAMR↑E

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

CORRECTING LINES

If you have made an error in the preceding line, you can delete that line. Simply type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		FRAME	
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
1ST FID. X	SXXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
1ST FID. X	SXXX.XXX		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters. For example,

ENTER SYSTEM NAME		FRAME	
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
1ST FID. X	SXXX.XXX	+000.000	
1ST FID. Y	SXXX.XXX	DELET	RETURN key
1ST FID. X	SXXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
1ST FID. X	SXXX.XXX		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

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CORRECTING AN ENTIRE PARAMETER LIST

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

TERMINATING FRAME OPERATIONS

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the crosshairs over the point marked earlier as fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 1 and this message:

SEND NEXT FID

Place the crosshairs over fiducial 2. Transmit fiducial 2 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 2 and this message:

SEND NEXT FID

Place the crosshairs over fiducial 3. Transmit fiducial 3 to the program by pressing the FIDUCIAL button. You will receive the comparator coordinates of fiducial 3 and this message:

VIEWER INITIALIZED

TRANSMITTING POINTS FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter. 25X1

TERMINATING FRAME OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time the fiducials were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE OUTPUT

ENTER SYSTEM NAME		FRAME
LOAD FILM		
PROJECT NUMBER	XXXXXX	920022
1ST FID. X	SXXX.XXX	+000.000
1ST FID. Y	SXXX.XXX	+000.000
2ND FID. X	SXXX.XXX	+090.000
2ND FID. Y	SXXX.XXX	-090.000
3RD FID. X	SXXX.XXX	+000.000
3RD FID. Y	SXXX.XXX	-090.000
FOCAL LENGTH	XXXX.XXX	0600.090
PITCH	SXX-XX	+00-56

ROLL	SXX-XX	-12-09
YAW	SXX-XX	-09-00
ORDER	ZZZ	YRP
ALTITUDE	XXXXXXX	0700000
ELEVATION	SXXXXX	+01000
VELOCITY	XXXXX	23000
AZIMUTH	XXX-XX.X	123-09.0
LATITUDE	XX-XX.XXZ	12-09.77S
LONGITUDE	XXX-XX.XXZ	123-23.99W
SUN ANGLE	XX-XX	09-09
SOLAR AZ	XXX-XX	111-11
PLOT DIST	XX.X	21.0

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 0
Y FID=+ 0

SEND NEXT FID

X FID=+ 90090
Y FID=- 90000

SEND NEXT FID

X FID=+ 0
Y FID=- 90000

VIEWER INITIALIZED

LAT= 12D 29M 30.8S S
LONG= 123D 39M 32.4S W

FIRST TERMINAL FID RECEIVED

FRAME OPERATIONS TERMINATED FEB. 25,69 1559

POINTING COUNT= 5 FILM DRIFT= 6.00 MICRONS

25X1 CHAPTER IX. PROCESSING [redacted] PHOTOGRAPHY

25X1 You may use this option [redacted] for processing any [redacted] photography. 25X1
Using the Real-Time Mensuration Program to process photography under this option involves these steps in the order listed.

STEP 1 obtaining parameters

STEP 2 marking fiducials

STEP 3 initializing a teletype

STEP 4 submitting parameters

STEP 5 initializing a comparator

STEP 6 transmitting points for calculations

STEP 7 terminating frame operations

OBTAINING PARAMETERS

You will be responsible for obtaining all parameters needed for each use of the program. Parameters will identify the film you are processing, and they will be transmitted via an on-line teletype. If you want the program to produce a plot, you will also need a parameter for plot distance. The use of this capability is optional.

Before you use the program, assemble all required parameters. These parameters and some of their sources are listed in Table 30. Because of the wide range of photography that can be used with this option, all sources do not appear in the table. You must determine the best source where no source is provided.

25X1

Table 30. Parameters Needed for [redacted] Option

Parameter	Source
25X1 System name; [redacted]	This manual
Project number; assigned by NPIC; 6 digits + alpha suffix if applicable	Current MIS active project listing
Focal length; millimeters	- - - -
Tilt; attitude relative to ground track for camera; degrees & minutes	- - - -
Swing; attitude relative to ground track for camera; degrees & minutes	- - - -
Altitude; of vehicle when photo was taken; above mean sea level; feet	- - - -
Elevation; average elevation of target area on photo; positive if above sea level; feet	Maps & research material
Frame R or L; relative location of film to camera at exposure time; R=right, L=left	This manual
Latitude; geodetic position of vehicle at exposure time; degrees, minutes & direction	- - - -
Longitude; geodetic position of vehicle at exposure time; degrees, minutes & direction	- - - -

Table 30. Parameters Needed for [ ] Option (Continued)

25X1

Azimuth; ground track; of vehicle at exposure time; degrees & minutes	- - - -
Sun angle; degrees & minutes	- - - -
Solar azimuth; for photo at exposure time; degrees & minutes	- - - -
Plot distance; optional; distance in inches on plotter; for plotter initialization, used with image limits to determine scale	To meet your specifications
Translation; distance from principal point to format edge; microns	You measure & record

MARKING FIDUCIALS

Mount the film positive, emulsion side up, on a light table. Using a template for [redacted] photography, locate the principal point of the photograph; it will be outside the format edge. Measure the distance from the principal point to the nearest format edge. Record this as the translation; you will submit this value as a parameter. (See Table 30.) Mark the point on the format edge closest to the principal point as fiducial 1. Mark a point about two to four inches along this same format edge in the direction of flight. This point will be fiducial 2.

25X1

INITIALIZING A TELETYPE

Before you can measure using the Real-Time Mensuration Program, the teletype must be initialized, that is, you must indicate to the program the type of photography to be processed. To initialize a teletype follow these instructions in the order given.

Press & release	ALT MODE key
Press	CTRL + U keys (simultaneously)
Type	INIT
Press	RETURN key

You will then receive this message on the teletype:

ENTER SYSTEM NAME

Next,

Type	[redacted]
Press	RETURN key

25X1

You will then receive this message:

LOAD FILM

Load the film positive on the comparator. The emulsion may be either up or down. Procedures for mounting film on a comparator will depend on which comparator you use. These procedures can be found in CHAPTER II, THE EQUIPMENT.

SUBMITTING PARAMETERS

You will now receive a series of messages requesting parameters. Each message will consist of a request for a specific parameter and the format of that parameter. Characters used in the formats are these:

X = number
Z = letter
S = plus or minus sign
- = dash
. = decimal point

As you receive each message, type the requested parameter in the correct format and then press the RETURN key. You must press the RETURN key after you enter each parameter. For example, when you receive this message

PROJECT NUMBER XXXXXX

complete the message by typing the correct project number.

PROJECT NUMBER XXXXXX 920022

Then press the RETURN key.

The program provides you with three methods for correcting errors. If you make an error(s) while submitting parameters, follow the appropriate set of instructions.

CORRECTING CHARACTERS

If the last character you typed was erroneous, you can correct it by using the upper case symbol on the N key (↑). Press the SHIFT key and the N key simultaneously. Pressing these keys will produce an arrow and delete the preceding character from the transmission. Then type the correct character. The incorrect character will remain on the printed page. For example:

ENTER SYSTEM NAME TAK↑L

You can delete up to five consecutive characters. If you have more than one character to correct, press the SHIFT key and the N key to delete each one. Then type the correct characters.

CORRECTING LINES

If you have made an error in the preceding line, you can delete that line. Simple type DELET and then press the RETURN key. The preceding line, i.e., the parameter and its format, will be reprinted. Type the correct parameter and then press the RETURN key. For example,

ENTER SYSTEM NAME		[redacted]	25X1
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
FOCAL LENGTH	XXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
FOCAL LENGTH	XXX.XXX		

You may delete as many lines as you wish. If you have more than one line to delete, type DELET and then press the RETURN key for each

line. Each time you do this, the program will back up the parameter list one line. After you have deleted the last erroneous line and that parameter and its format have been reprinted, resume typing parameters.

For example,

ENTER SYSTEM NAME		[redacted]	25X1
LOAD FILM			
PROJECT NUMBER	XXXXXX	920032	
FOCAL LENGTH	XXX.XXX	120.000	
TILT	SXX-XX	DELET	RETURN key
FOCAL LENGTH	XXX.XXX	DELET	RETURN key
PROJECT NUMBER	XXXXXX	920022	RETURN key
FOCAL LENGTH	XXX.XXX		

Except for the first parameter, i.e., the system name, all parameters may be deleted using this method.

CORRECTING AN ENTIRE PARAMETER LIST

If you find that you have made several errors, you can delete the entire parameter list and begin again. To do this, type INIT and then press the RETURN key. The teletype will reprint ENTER SYSTEM NAME. Simply type the parameters again.

TERMINATING FRAME OPERATIONS

At any time while you are submitting parameters, you may terminate frame operations. If you decide not to continue processing for any reason, simply type TERM and then press the RETURN key. The teletype will print TERM.

INITIALIZING A COMPARATOR

After you have submitted all parameters, this message will appear on the teletype you are using:

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

Check the coordinate count on the control panel. The maximum permissible count is 999999. If the count is 9ØØØØØ or over, reset the counter to ØØØØØØ.

Before you can use a comparator to obtain dimensional data, it must be initialized, i.e., you must transmit fiducials to the program to establish a coordinate system. Using the X and Y drive and the X and Y wheels, place the comparator crosshairs over the point marked earlier as fiducial 1. Transmit fiducial 1 to the program by pressing the FIDUCIAL button. You will then receive the coordinates of fiducial 1 via the teletype. You will also receive this message:

SEND NEXT FIDUCIAL

Move the crosshairs along the format edge until you locate the point marked earlier as fiducial 2. Transmit fiducial 2 by pressing the FIDUCIAL button. You will receive the coordinates of fiducial 2 on the teletype. You will also receive this message:

VIEWER INITIALIZED

TRANSMITTING POINTS FOR CALCULATIONS

You are now ready to transmit points to be used for calculations by the Real-Time Mensuration Program. However, if you want the program to

produce a plot, you must first initialize the plotter. (See CHAPTER II, INITIALIZING A PLOTTER section.) Then follow the instructions given below for transmitting points for calculations.

1. Release any output function buttons that may have been pressed.

2. Press the appropriate output function buttons for the calculations you want.

3. Position the comparator crosshairs over each point you want to transmit. Transmit each of these points to the program by pressing the appropriate transmission button.

Mensural calculations will be printed on the teletype. If you have elected to have the program produce a plot, you will also receive that on the [redacted] plotter. 25X1

TERMINATING FRAME OPERATIONS

After all measurements have been calculated, operations for the frame being processed must be terminated by pressing the FIDUCIAL button. Place the comparator crosshairs over fiducial 1. Press the FIDUCIAL button to begin the termination of frame operations. You will then receive this message on the teletype:

FIRST TERMINAL FID RECEIVED

Measurements can continue to be calculated until you press the FIDUCIAL button twice in succession. When you press the FIDUCIAL button a second time, you will receive this message:

FRAME OPERATIONS TERMINATED DATE TIME
POINTING COUNT = XX FILM DRIFT = XX.XX MICRONS

The pointing count is the total number of points transmitted including fiducials. Film drift is the distance the film has moved at fiducial 1 from the time the fiducials were first transmitted until frame operations were terminated. Extensive film drift may result in inaccurate mensural calculations.

SAMPLE TELETYPE OUTPUT

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```
ENTER SYSTEM NAME [redacted]
LOAD FILM EMULSION UP
PROJECT NUMBER    XXXXXX      920022
FOCAL LENGTH      XXX.XXX     120.000
TILT              SXX-XX      -09-44
SWING             SXX-XX      +12-00
ALTITUDE          XXXXXXX     0060000
ELEVATION         SXXXXX      +00090
FRAME R OR L      Z           L
LATITUDE          XX-XX.XXZ   11-09.44S
LONGITUDE         XXX-XX.XXZ  111-00.22E
AZIMUTH           XXX-XX.X    090-00.0
SUN ANGLE         XX-XX       11-22
SOLAR AZ          XXX-XX      111-33
PLOT DIST         XX.X        20.0
TRANSLATION       XXXXXX      005000

INITIALIZE VIEWER--SEND FIRST FIDUCIAL

X FID=+ 0
Y FID=+ 0
```

SEND NEXT FID

X FID=+ 0
Y FID=- 90000

VIEWER INITIALIZED

FIRST TERMINAL FID RECEIVED

AZ = 90.03 DEG

FRAME OPERATIONS TERMINATED FEB. 25,69 1552+

POINTING COUNT= 5 FILM DRIFT= .00 MICRONS

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CHAPTER X. TRANSMITTING SAMPLE POINTS FOR CALCULATIONS

Given a sample frame and the facilities that appear on that frame (Figure 13), assume that the required calculations for the sample are these:

Building A	length of sides; area; plot
Building B	geodetic coordinates; distance of three points from Building B; plot
Runway	length; azimuth; plot
Building C	relief height; width; length; plot
Railroad	azimuth (as it goes off the top of the frame)
	north arrow for plot

In Figure 13, the points are numbered in the order in which they may be transmitted for this sample. In addition, they are given alphabetic designators which denote the type of point to be transmitted. The designators used are I for initial, N for intermediate, T for terminal, and M for multiple. Instructions for transmitting the points to be used for calculations are given in Table 31.

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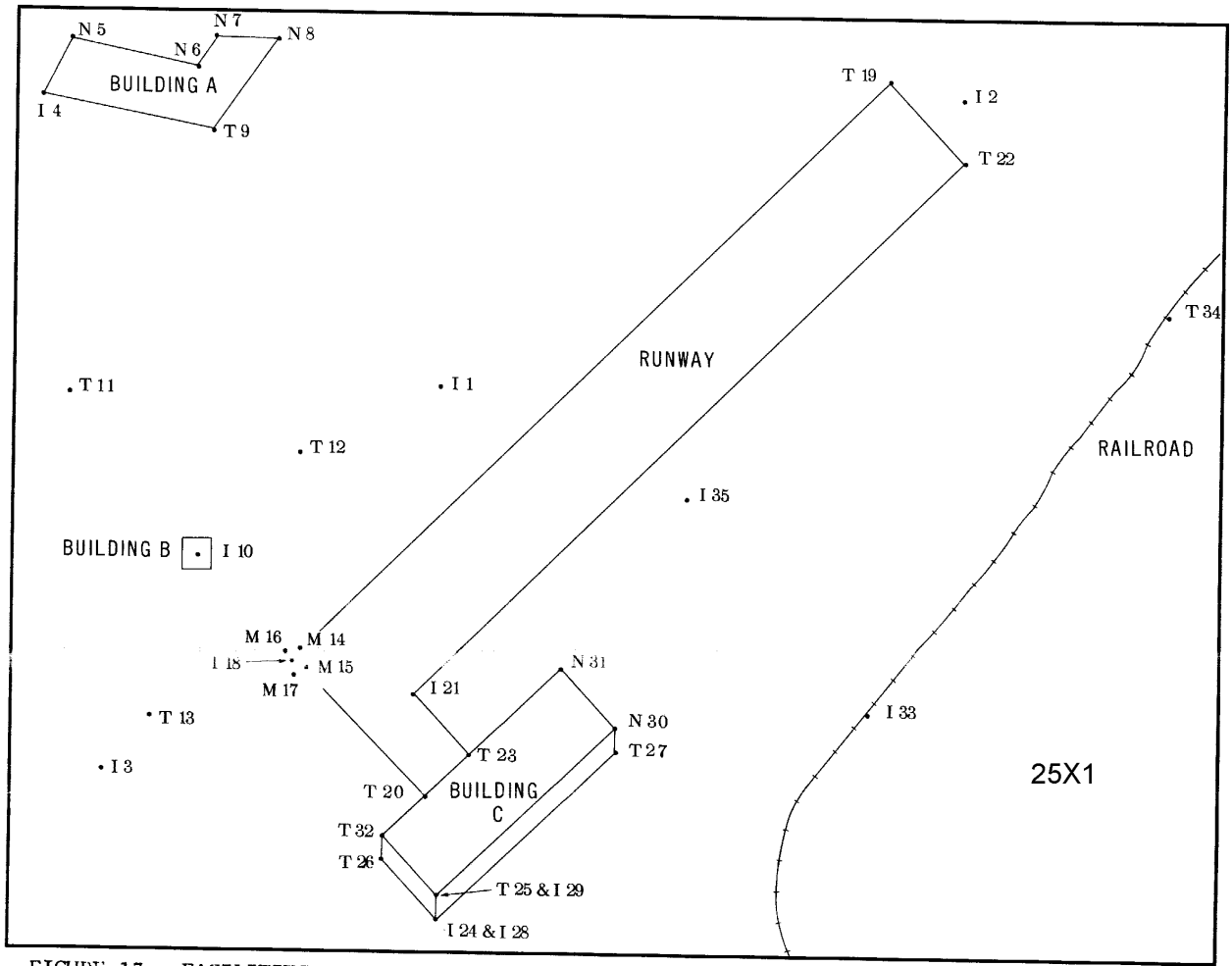

FIGURE 13. FACILITIES AND SAMPLE POINTS FOR CALCULATIONS. This figure is keyed to Table 31.

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Table 31. Instructions for Transmitting Sample Points for Calculations
(This table is keyed to Figure 13)

Required Calculation	Output Function Buttons	What To Transmit	Teletype Message
Bldg A plot	Press PLOTTER INITIALIZATION, CMC ECHO, POINT LABEL, & CHARACTER SEQUENCE	Transmit I1 as plotter origin	CMCX = 190000.00 MICRONS = 190000 COUNTS CMCY = 230326.00 MICRONS = 220326 COUNTS ORIGIN SET--SEND FIRST IMAGE LIMIT IDENT = TO 00001 CHAR SEQ = TO I
		Transmit I2 as 1 outer limit of plot	CMCX = 360110.00 MICRONS = 360110 COUNTS CMCY = 311006.00 MICRONS = 311006 COUNTS SEND LAST IMAGE LIMIT IDENT = 00001 TO 00002 CHAR SEQ = TO I
		Transmit I3 as other limit of plot	CMCX = 70091.00 MICRONS = 70091 COUNTS CMCY = 49936.00 MICRONS = 49936 COUNTS PLOTTER INITIALIZED SCALE 1:3624 IDENT = 00002 TO 00003 CHAR SEQ = TO I
Bldg A length of sides area	Release PLOTTER INITIALIZATION; press AREA, LINE PLOT, & DISTANCE	Transmit corner of Bldg A as I4	CMCX = 38109.00 = 38109 COUNTS CMCY = 301037.00 MICRONS = 301037 COUNTS IDENT = 00003 TO 00004 CHAR SEQ = TO I
		Transmit next corner as N5	[redacted] 25X1 CMCX = 50073.00 MICRONS = 50073 COUNTS CMCY = 321103.00 MICRONS = 321103 COUNTS IDENT = 00004 TO 00005 CHAR SEQ = I TO N
		Transmit next corner as N6	[redacted] 25X1 CMCX = 94935.00 MICRONS = 94935 COUNTS CMCY = 312022.00 MICRONS = 312022 COUNTS IDENT = 00005 TO 00006 CHAR SEQ = N TO N
		Transmit next corner as N7	[redacted] 25X1 CMCX = 100030.00 MICRONS = 100030 COUNTS CMCY = 320006.00 MICRONS = 320006 COUNTS IDENT = 00006 TO 00007 CHAR SEQ = N TO N
		Transmit next corner as N8	[redacted] 25X1 CMCX = 119688.00 MICRONS = 119688 COUNTS CMCY = 320205.00 MICRONS = 320205 COUNTS IDENT = 00007 TO 00008 CHAR SEQ = N TO N
		Transmit last corner as T9	[redacted] 25X1 AREA = 15805 SQ FT = 0.3628 ACRES CMCX = 99832.00 MICRONS = 99832 COUNTS CMCY = 290010.00 MICRONS = 290010 COUNTS IDENT = 00008 TO 00009 CHAR SEQ = N TO T
			[redacted] 25X1 IDENT = 00009 TO 00001 CHAR SEQ = T TO I
Bldg B Geo-coordinates	Release AREA, LINE PLOT, & DISTANCE; press GEODETIC COORDINATES & POINT PLOT	Transmit center point of Bldg B as I10	CMCX = 95305.00 MICRONS = 95305 COUNTS CMCY = 136009.00 MICRONS = 136009 COUNTS LAT = 27D 49M 49.4S N LONG = 82D 29M 9.0S W IDENT = TO 00010 CHAR SEQ = TO I
Distance of 3 points from Bldg B plot	Release GEODETIC COORDINATE; press DISTANCE	Transmit T11	[redacted] 25X1 CMCX = 53621.00 MICRONS = 53621 COUNTS CMCY = 145145.00 MICRONS = 145145 COUNTS IDENT = 00010 TO 00011 CHAR SEQ = I TO T
		Transmit T12	[redacted] 25X1 CMCX = 130202.00 MICRONS = 130202 COUNTS CMCY = 200232.00 MICRONS = 200232 COUNTS IDENT = 00010 TO 00012 CHAR SEQ = I TO T
		Transmit T13	[redacted] 25X1 CMCX = 79892.00 MICRONS = 79892 COUNTS CMCY = 177097.00 MICRONS = 177097 COUNTS IDENT = 00010 TO 00013 CHAR SEQ = I TO T
Runway length plot	Release POINT PLOT; press LINE PLOT	Transmit M14, M15, M16, & M17 as multiple points for obscured corner Transmit same corner of runway as I18	CMCX = 130100.00 MICRONS = 130100 COUNTS CMCY = 130862.00 MICRONS = 130862 COUNTS IDENT = TO 00018 CHAR SEQ = TO I
		Transmit opposite end of runway as T19	[redacted] 25X1 25X1 CMCX = 330123.00 MICRONS = 330123 COUNTS CMCY = 310066.00 MICRONS = 310066 COUNTS IDENT = 00018 TO 00019 CHAR SEQ = I TO T
		Transmit T20	[redacted] 25X1 CMCX = 175532.00 MICRONS = 175532 COUNTS CMCY = 65022.00 MICRONS = 65022 COUNTS IDENT = 00018 TO 00020 CHAR SEQ = I TO T

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[redacted] 25X1

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Table 31. Instructions for Transmitting Sample Points for Calculations (Continued)

Required Calculation	Output Function Buttons	What To Transmit	Teletype Message
Runway azimuth	Press AZIMUTH	Transmit I21	CMCX = 171186.00 MICRONS = 171186 COUNTS CMCY = 100039.00 MICRONS = 100039 COUNTS IDENT = TO 00021 CHAR SEQ = TO I
		Transmit T22	[redacted] AZ = 136.521 DEG CMCX = 355518.00 MICRONS = 355518 COUNTS CMCY = 285857.00 MICRONS = 285857 COUNTS IDENT = 00021 TO 00022 CHAR SEQ = I TO I
		Transmit T23	[redacted] AZ = 216.550 DEG CMCX = 190096.00 MICRONS = 190096 COUNTS CMCY = 78554.00 MICRONS = 78554 COUNTS IDENT = 00021 TO 00023 CHAR SEQ = I TO T
Bldg C relief height	Release DISTANCE, AZIMUTH, & LINE PLOT; press RELIEF HEIGHT	Transmit bottom corner of Bldg C as I24	CMCX = 180100.00 MICRONS = 180100 COUNTS CMCY = 22516.00 MICRONS = 22516 COUNTS IDENT = TO 00024 CHAR SEQ = TO I
		Transmit corresponding top corner of Bldg C as T25	[redacted] CMCX = 180136.00 MICRONS = 180136 COUNTS CMCY = 25036.00 MICRONS = 25036 COUNTS IDENT = 00024 TO 00025 CHAR SEQ = I TO T
Bldg C width	Release RELIEF HEIGHT; press DISTANCE	Transmit T26	[redacted] CMCX = 160779.00 MICRONS = 160779 COUNTS CMCY = 42538.00 MICRONS = 42538 COUNTS IDENT = 00024 TO 00026 CHAR SEQ = I TO T
Bldg C length		Transmit T27	[redacted] CMCX = 240392.00 MICRONS = 240392 COUNTS CMCY = 81132.00 MICRONS = 81132 COUNTS IDENT = 00024 TO 00027 CHAR SEQ = I TO T
Bldg C plot	Release DISTANCE; press LINE PLOT	Transmit I28	CMCX = 180100.00 MICRONS = 180100 COUNTS CMCY = 22516.00 MICRONS = 22516 COUNTS IDENT = TO 00028 CHAR SEQ = TO I
	Release LINE PLOT; press RELIEF PLOT	Transmit I29	CMCX = 180136.00 MICRONS = 180136 COUNTS CMCY = 25036.00 MICRONS = 25036 COUNTS RELIEF PLOT READY IDENT = TO 00029 CHAR SEQ = TO I
		Transmit N30	CMCX = 240428.00 MICRONS = 240428 COUNTS CMCY = 83652.00 MICRONS = 83652 COUNTS IDENT = 00029 TO 00030 CHAR SEQ = I TO N
		Transmit N31	CMCX = 220311.00 MICRONS = 220311 COUNTS CMCY = 83762.00 MICRONS = 83762 COUNTS IDENT = 00030 TO 00031 CHAR SEQ = N TO N
		Transmit T32	CMCX = 160818.00 MICRONS = 160818 COUNTS CMCY = 46062.00 MICRONS = 46062 COUNTS IDENT = 00031 TO 00032 CHAR SEQ = N TO T IDENT = 00032 TO 00029 CHAR SEQ = T TO I
Railroad azimuth (as it goes off top of frame)	Release RELIEF PLOT; press AZIMUTH	Transmit I33	CMCX = 325325.00 MICRONS = 325325 COUNTS CMCY = 90900.00 MICRONS = 90900 COUNTS IDENT = TO 00033 CHAR SEQ = TO I
		Transmit T34	[redacted] CMCX = 425406.00 MICRONS = 425406 COUNTS CMCY = 220266.00 MICRONS = 220266 COUNTS IDENT = 00033 TO 00034 CHAR SEQ = I TO T
North arrow	Release AZIMUTH; press NORTH ARROW Move pen head on plotter to an area with no line or points	Transmit I35	CMCX = 425406.00 MICRONS = 425406 COUNTS CMCY = 220266.00 MICRONS = 220266 COUNTS IDENT = TO 00035 CHAR SEQ = TO I

CHAPTER XI. ERROR MESSAGES

If an error of any type occurs, a message will be typed via the teletype. All of the error messages incorporated in the RTMP, their causes, and what to do if you receive one appear on the following pages. The messages are listed in alphabetical order.

E R R O R M E S S A G E S

(F=fiducial, I=initial, M=multiple, N=intermediate, T=terminal)

Error Message	Cause	What To Do
ALL POINTS DELETED	In variable filmspeed option, transmitted N points deleted all I points required for determining measured filmspeed	Transmit I points again as specified in appropriate option; do not reinitialize teletype
ATUP4B	Error in attitude update portion of KMP	Notify AID
AZIMUTH PT DIST ERROR	Point that is less than 2 ft from previous point transmitted to get azimuth	Transmit point that is at least 2 ft from previous point

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
BUSY	Communication lines to program operating at full capacity	No new request can be handled at this time; wait & then try to initialize teletype again
CHARACTER OVERFLOW	More than 10 characters entered for one parameter	Enter parameter in correct format; format is printed via teletype
CHIP MATH ERROR	Conversion error on Chip comparator	Notify AMB/AID

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
CMCECHO IS IN ERROR	Conversion error	Check points transmitted & then transmit sequence again; if error persists, notify AMB/AID; continue transmitting points for other output
COMPUTATION ERROR	Program unable to calculate results of points transmitted	Check points transmitted & then transmit sequence again; if error persists, notify AMB/AID
DRUM READ ERROR	Problem encountered in attempt to read data from mass storage area	Notify AMB/AID

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
DRUM WRITE ERROR	Problem encountered in attempt to place data on mass storage area	Notify AMB/AID
ENTER FIDUCIAL	Points to be used for calculations transmitted before comparator initialization	Initialize comparator by sending fiducials
ERROR IN DATA CONVERSION	Problem encountered in attempt to convert data to compatible form	Notify AMB/AID
ERROR - NOTIFY AMB/AID	Error	Notify AMB/AID

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
ERROR - RESEND PT SEQUENCE	Computer malfunction	Parameters & fiducials recovered; begin with I point of sequence & continue transmitting points
FILM DRIFT MATH ERROR	Conversion error	Notify AMB/AID; calculations are accurate because frame operations were terminated
FLOATING POINT ERROR	Error detected during calculations	Attempt to obtain calculations again; if error persists, notify AMB/AID
FORMAT ERROR	Parameter did not conform to format	Enter parameter in correct format; format is printed via teletype

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
HARDWARE ERROR	Hardware error	Notify AMB/AID
HARDWARE ERROR - DRUM	Hardware error	Notify AMB/AID
ILLEGAL FRAME	MPF options only; frame (or accession) number entered as parameter not part of specified pass (or revolution) for mission indicated	Reinitialize teletype; enter correct mission, pass, & frame numbers or mission, revolution, & accession numbers
ILLEGAL GRID	Three possible causes: 1) x coordinate of grid greater than 92 cm 2) y coordinate of grid greater than 24 cm 3) both 1 & 2	Reenter grid coordinates with x<92 & y<24 cm

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
ILLEGAL PASS	MPF options only; pass (or revolution) number entered as parameter not part of mission indicated	Reinitialize teletype; enter correct mission, pass, & frame numbers or mission, revolution, & accession numbers
ILLEGAL PLT POINT	Point other than I transmitted for north arrow	Transmit I point for north arrow
ILLEGAL PLT POINT SEQUENCE	Point other than I transmitted for plotter initialization	If plot is desired, resend last point as I point If no plot is desired, release all plot output buttons

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
ILLEGAL POINT DESIGNATOR	Point designator other than F, I, N, T, or M received by program	Transmit last point again; if error persists, contact hardware maintenance personnel
ILLEGAL POINT SEQUENCE	Points transmitted out of sequence for desired output; e.g., a T point followed by an N when distance is desired output	Transmit points in correct sequence for desired output
ILLEGAL SYSTEM NAME	Erroneous entry for system name typed via teletype	Type correct system name (acronym for option, e.g., K4ER)

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
INITIALIZE PLOTTER	Plot output function buttons pressed before initialization of plotter	If plot is desired, initialize plotter as specified in CHAPTER II If no plot is desired, release all plot output function buttons
INPUT POINTS ARE EQUAL	In AUP4B option, same control point transmitted twice	Transmit two correct control points & then continue; do not reinitialize teletype
LINE PLOT ERROR	Point that is more than 29.5 inches from previous point transmitted for line plot	Transmit points within area specified during plotter initialization; previous point disregarded

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
LOCKOUT RELEASED	Hardware malfunction	Retype last parameter or retransmit last point, whichever is applicable
MAGNITUDE ERROR	Parameter not within logical bounds	Enter correct parameter
MATH MODEL ERROR	Conversion error in math model	Notify AMD/AID
MISSION NOT AVAILABLE	Parameter for mission specified not in MPF	Process photography under option that does not retrieve parameters from MPF; e.g., if using K4BR, use K4B & enter all parameters specified in table

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
MULTIPLE PLOT ERROR	More than one output function buttons pressed	Release all plot output function buttons except one desired
NO CONVERGENCE IN 6 ITERATIONS	Parameters for control latitude, longitude, & azimuth do not correspond to control points transmitted via comparator	Check parameters & points transmitted; if error is found, reinitialize teletype, enter correct parameters & transmit correct control points If original input was accurate, then AUP4B option can not be used to process frame

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
NO OUTPUT REQUESTED	No output function buttons pressed when points to be used for calculations were transmitted	Press appropriate output function buttons & then transmit points
NO PLOT AVAILABLE	Plot output function button pressed on comparator at remote station that has no plotter	Release plot output function button or go to remote station that has [redacted] plotter
NORTH ARROW ERROR	Error detected in north arrow plotter routine	Attempt to plot north arrow again; if error persists, notify AMB/AID; plot is all right

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
PLOT RELIEF SEQUENCE ERROR	Other than I point sent as first point of sequence for which plot relief is desired output	Send correct I point; previous point disregarded
PLOTTER INITIALIZATION ERROR	Two possible causes: 1) attempt made to obtain plot when plot distance of Ø was entered as parameter	If no plot is desired, release plot output function buttons & continue measuring If plot is desired, reenter all parameters including correct parameter for plot distance; reinitialize plotter
	2) same point sent as two different target limits for plotter initialization	Reinitialize plotter by sending three I points: target center & two different target limits

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
POINT PLOT ERROR	Point that is more than 29.5 inches from previous point transmitted for point plot	Transmit points within area specified during plotter initialization; previous point disregarded
POINTING ERROR	Variable filmspeed options only; time marks required for determining measured filmspeed transmitted starting at fiducial 1 rather than fiducial 2	Time marks required for determining measured film-speed must be transmitted starting at fiducial 2; transmit points correctly; previous points disregarded; do not reinitialize tele-type

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E R R O R M E S S A G E S (Continued)

Error Message	Cause	What To Do
READY - INITIALIZE TELETYPE	Computer malfunction	Reinitialize teletype; parameters not recovered; reenter parameters
RETRIEVAL FILE DESTROYED	MPF file destroyed; in process of being re-created	Wait 10-minute intervals & keep trying to initialize teletype or process photography under option that does not retrieve from MPF (e.g., if using K4BR, use K4B & enter parameters in table)
RETRIEVAL MATH ERROR	Unsuccessful MPF retrieval	Notify AMB/AID

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ERROR MESSAGES (Continued)

Error Message	Cause	What To Do
RETRIEVAL OUTPUT ERROR	Error detected in transmission of teletype message	Notify AMB/AID
TELETYPE IS LOCKED OUT	Information typed via teletype after comparator initialization	If calculations are desired, transmit points via comparator; no information should be typed at this time; if starting to process new frame, reinitialize teletype

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E R R O R M E S S A G E S (Continued)

Error Message	Cause	What To Do
VIEWER INITIALIZATION ERROR	Same point transmitted for both fiducials 1 & 2 during comparator initialization	Transmit correct fiducials; message can also be received purposely; i.e., if after transmitting fiducial 1 you realize it was erroneous, transmit the erroneous point a second time; you will receive this error message; then transmit correct fiducials
VIEWER IS LOCKED OUT	Attempt made to transmit points to be used for calculations before comparator initialization	Reinitialize teletype & initialize comparator

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